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# **EXPERIMENT STATION**

**HORTICULTURAL DEPARTMENT**

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- 151. Raspberries, Blackberries and Grapes**
  - 152. Report South Haven Sub-Station, 1897**
  - 153. Vegetable Tests, 1897**
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**AGRICULTURAL COLLEGE, MICHIGAN**  
**1898**



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### SUB-STATIONS

Grayling, Crawford County, 80 acres deeded.  
 South Haven, Van Buren County, 10 acres rented; 5 acres deeded.

## RASPBERRIES, BLACKBERRIES AND GRAPES.

BY L. R. TAFT AND H. P. GLADDEN.

## RASPBERRIES.

A few varieties of raspberries were badly killed back by the winter, but most sorts were in good condition for fruiting in the spring. Considerable anthracnose was present, but spraying with Bordeaux mixture kept the disease in check until after the berries were picked, when the old canes were removed and burned. The excessive rainfall on a soil where the quicksand closely approaches the surface, seriously injured many sorts.

## NOTES ON VARIETIES.

*Beckwith*.—Received from M. H. Beckwith, Newark, Del. The growth of cane and foliage is somewhat like *Columbian*, though the canes are lighter in color, with more numerous but shorter spines; the leaves are larger, coarser in texture and a darker green. Berries are large, purple, scarcely so dark as *Columbian*, but they are firmer and of better quality. This is the first year of fruiting and the growth was too small to judge of productiveness.

*Black Diamond*.—Received from C. M. Stewart & Co., Newark, N. Y. Appears to be of strong, healthy growth. The berries are large, jet black and shining, rather long conical in form and of high quality. A few fruits ripened with *Kansas*, but the main crop is a few days later. It may prove a valuable sort to come between *Kansas* and *Gregg*.

*Conrath*.—The cane growth was not so strong and healthy as is usual with this variety, but a fair crop of good sized berries was borne. We regard this as a valuable medium early market berry.

*Columbian*.—This variety suffered badly from anthracnose, and the berries were much smaller in size and produced in less quantity than in former seasons. One of the best of the purple cap class.

*Farnsworth*.—The canes were of good growth, stood the winter well and were quite free from disease. A very desirable sort for home use or market.

*Gault*.—This sort has never been of strong growth and the canes have borne but little fruit. It has never given promise of much value here.



## BLACK AND HYBRID RASPBERRIES.

## ABBREVIATIONS.

Size.	Form.	Color.
s, small.	r, round.	b, black.
m, medium.	c, conical.	p, purple.
l, large.	o, ovate.	g, glossy.
		l, light.
		o, orange.
		pu, pubescent.

Variety.	Vigor.	Date bloom.	Date first ripe fruits.	Date last fruits.	Productiveness. (1-10).	Size.	Form.	Color.	Quality.
Beckwith.....	9	June 17	July 19	July 31	8.8	l	ro	p	9.5
Black Diamond.....	9.5	" 14	" 12	" 29	8.5	l	ro	b	8.8
Caroline.....	9.5	" 15	" 12	" 27	8	m	r	lo	8
Conrath.....	8	" 12	" 12	" 28	8.5	l	r	b	8
Columbian.....	9	" 18	" 16	" 31	8.8	m	ro	p	8.5
Ebon Beauty.....	4	" 14	" 13	" 27	4	m	ro	b	7
Eureka.....	8	" 14	" 11	" 27	6.5	l	ro	b	7
Farnsworth.....	7.5	" 14	" 12	" 30	8.5	l	r	b	8.5
Gault.....	4	" 14	" 12	" 28	5	m	ro	b	8.5
Green.....	6	" 12	" 12	" 28	6.5	l	r	o pu	9
Gregg.....	5	" 14	" 14	" 30	8	l	r	b pu	7
Johnston.....	8.5	" 11	" 11	" 28	7.5	m	r	b	6
Kansas.....	9	" 12	" 13	" 29	9	l	r	g b	8.5
Lovett.....	4	" 12	" 11	" 28	6	m	r	b	8
May King.....	3	" 12	" 12	" 27	2	s	ro	b	7.5
Mill's No. 15.....	9.5	" 12	" 12	" 31	9	l	ro	b	8.5
Nemaha.....	4.5	" 14	" 16	" 31	8.8	l	r	b pu	7
Ohio.....	6	" 10	" 11	" 27	8	l	r	b	6
Older.....	8.5	" 12	" 12	" 30	8	l	r	b	9
Palmer.....	8.5	" 11	" 8	" 27	8.5	m	r	b	8.5
Progress.....	4	" 12	" 11	" 28	5	s	r	b	8.5
Redfield.....	8	" 17	" 12	" 29	8.5	m	ro	p	8
Shaffer.....	8	" 20	" 15	" 31	8.8	l	rs	p	8.5
Wonder.....	5	" 14	" 14	" 28	2	m	ro	b	8.8

*Green.*—Bush was of weak growth and but a small crop of fruit was borne. The berries are of good size, rather soft but of good quality. The variety was sent out as Green's New Raspberry, an objectionable name.

*Gregg.*—Perhaps the best late market sort. The canes are often badly injured by the winter and the variety should only be planted on a high, well-drained location.

*Kansas.*—This variety has been grown for several seasons and has uniformly given good results. The bush is of strong, healthy growth, and the canes are quite hardy. The berries are large, of fine appearance, though not of high quality.

*Mills No. 15.*—The canes are of good growth and stand the winter well. The berries are large, jet black in color, not so dry or firm as Gregg, but better in quality. In season a little earlier than Gregg. Appears to be of considerable promise.

*Ohio.*—While this variety usually produces a large crop, the berries are very poor in quality. It is the leading sort for evaporating purposes.

*Older.*—The berries are large and of high quality, but soft. As the variety is productive it is valuable for home use.

*Palmer*.—One of the best early market sorts.

*Redfield*.—Received from J. Wragg & Son, Waukeg, Iowa. Canes of very strong growth, dark purple color, covered with white bloom; spines few, short. Fruits of purple cap class, smaller in size than the Shaffer and more acid in flavor. This was the first year of fruiting.

*Shaffer*.—This variety is quite susceptible to attacks of anthracnose. One of the best varieties for canning and home use.

*Ebon Beauty, Eureka, Johnston, Lovett, May King, Progress* and *Wonder* were of weak cane growth and bore but a small crop of fruit.

## RED RASPBERRIES.

## ABBREVIATIONS.

Size.	Form.	Color.
s small.	r round.	d dark.
m medium.	c conical.	o orange.
l large.	o ovate.	r red.
		b bright.
		p purple.

Variety.	Vigor.	Date bloom.	Date first ripe fruits.	Date last fruits.	Productiveness.	Size.	Form.	Color.	Quality.
Brandywine.....	9	June 17	July 13	July 30	6	m	r	r	8.5
Cuthbert.....	9	" 21	" 16	" 31	9	l	rc	r	8
Golden Queen.....	9.2	" 17	" 15	" 31	8.5	l	rc	o	9.5
Hansell.....	5	" 16	" 11	" 29	7	m	r	dr	9
Kenyon.....	8.5	" 16	" 12	" 31	8.5	l	rc	do	9.5
King.....	9	" 16	" 7	" 30	7.5	l	rc	r	8.5
Loudon.....	8.5	" 16	" 11	" 31	8.5	l	rc	do	9.5
Marlboro.....	8.5	" 15	" 8	" 27	8.5	m	r	r	8.5
Michigan.....	8.5	" 12	" 6	" 31	8	m	r	r	8
Miller.....	7.5	" 16	" 14	" 31	6.5	s	rc	br	8
Miller's Woodland.....	9.2	" 12	" 8	" 27	7.5	m	r	r	8.5
Perry's Golden.....	9	" 17	" 15	" 31	8.5	l	rc	o	9.5
Phoenix.....	9	" 16	" 9	" 30	8.5	l	rc	dr	9.5
Royal Church.....	7	" 17	" 12	" 29	8	l	rc	do	8.5
Stayman No. 1.....	8	" 19	" 15	Aug. 6	7.5	l	rc	do	9
Thompson.....	6	" 16	" 8	July 27	7.5	m	r	dr	9
Turner.....	9	" 14	" 10	July 28	8	l	o	r	9

## NOTES ON VARIETIES.

*Cuthbert*.—Is still probably the leading market berry all points considered. *Golden Queen* and *Perry's Golden* are quite similar in bush and berry, and have a place as dessert varieties.

*Hansell* and *Michigan* are early and the fruits are bright in appearance and of fine quality; but *Marlboro* fruits are larger and while not of so good quality are usually produced in greater number, and the latter variety, therefore, is likely to prove more profitable as an early market sort.

*Loudon*.—Last year this variety ripened one week after *Cuthbert*; this year it was five days earlier than that sort. The canes are hardy, of good growth and productive. The fruits are large, very attractive in appearance, of high quality and firm. This variety is likely to prove a strong rival of the *Cuthbert*.

*Kenyon* appears to be identical with *Loudon*.

*King*.—Canes of good growth and healthy, but scarcely productive enough to make the variety profitable. The fruits are large, of fine color, rather dry and somewhat inclined to crumble and drop easily, seeds large. The quality is good though dry.

*Miller*.—Canes are not of strong growth and but a small crop of fruit was borne. The variety seems to have no points of special merit.

*Phoenix*.—Received from J. T. Lovett & Co., Little Silver, N. J. Not a large growth of cane, but productive for first year of fruiting. Berry very large, round conical, slightly elongated in form, rich, dark red color, and of very high quality. A variety of considerable promise.

*Royal Church*.—While the fruits are very attractive in appearance and of good quality, they crumble too easily to be of much commercial value.

*Stayman No. 1*.—This variety was scarcely so productive as last season. The canes are of stout, upright growth, and do not make enough laterals to bear a large crop of fruit. The berries are large, dark color and of good quality. The variety is very late to ripen and would be valuable to furnish a succession.

*Turner*.—Is valuable where a very hardy sort is required.

*All Summer, Henrietta, Herstine, Rivers Yellow* and *Yellow Antwerp* were killed to the ground and bore no fruit.

#### SUMMARY.

The following varieties of raspberries are the most reliable or promising for central Michigan.

#### BLACK CAPS.

*Palmer* for early. *Conrath* and *Kansas* for medium season, and *Gregg* for late. *Older* is excellent for home use. *Black Diamond* and *Mills No. 15*, are very promising.

#### PURPLE CAPS.

*Shaffer* and *Columbian* have given good satisfaction while *Beckwith* and *Redfield* are promising new sorts.

#### RED VARIETIES.

*Cuthbert* is still the leading variety of this class planted, though the newer sort, *Loudon*, appears superior in some respects. *Marlboro* and *Hansell* have a place as early sorts. *Phoenix* is a promising new variety and *Stayman No. 1* possesses the merit of ripening the bulk of the crop late.

#### BLACKBERRIES.

A few blackberries were quite severely injured by the winter, but most sorts were in good condition after cutting back in the spring, to bear a large crop of fruit. The frequent rains in July and August prevented the usual drouth occurring during that period and the blackberry crop was one of the largest and best ever grown here.

## BLACKBERRIES.

Name.	Vigor.	Date bloom.	Date first ripe fruits.	Date last fruits.	Productiveness.	Weight of berry in ounces.	Quality.
Agawam.....	7	June 11.....	July 24.....	August 27.....	7.5	1-18	8
Early Cluster.....	9.5	" 11.....	" 24.....	" 27.....	6.5	1-15	6.5
Early Harvest.....	8	" 18.....	" 23.....	" 23.....	3	1-18	8.5
Early King.....	9.8	" 17.....	" 16.....	" 6.....	8.5	1-9	8.5
Early Mammoth.....	8.5	" 21.....	" 31.....	" 28.....	4	1-6	8
Eldorado.....	9.8	" 19.....	" 27.....	September 4.....	10	1-12	9
Erie.....	9.5	" 12.....	" 26.....	August 28.....	8	1-14	7.5
Ford No 1.....	8	" 19.....	" 29.....	" 28.....	7.5	1-9	7
Jewett.....	9.5	" 16.....	" 27.....	" 30.....	6.5	1-9	8.5
Kittatinny.....	9.8	" 18.....	" 29.....	September 3.....	7.5	1-12	8
Lincoln.....	9.7	" 12.....	" 30.....	" 5.....	9.5	1-12	6.5
Lovett.....	9.5	" 18.....	" 30.....	August 27.....	8	1-12	6
Minnewaaki.....	9.8	" 11.....	" 26.....	" 27.....	7.5	1-18	7
Ohmer.....	8	" 21.....	" 29.....	" 30.....	2	1-9	8.5
Snyder.....	9.8	" 10.....	" 29.....	September 4.....	10	1-12	9
Stone's Hardy.....	9.8	" 10.....	" 28.....	" 3.....	8	1-12	8.5
Taylor.....	9.8	" 12.....	" 29.....	" 4.....	9.5	1-12	9
Wachusett.....	8.6	" 15.....	" 28.....	August 30.....	7	1-18	8.5
Wilson Jr.....	9.4	" 12.....	" 27.....	" 24.....	8	1-12	7.5

## NOTES ON VARIETIES.

*Early Harvest* is early and the fruits though small are of good quality. The canes, however, are so lacking in hardiness that the variety is poorly adapted to this section, unless the canes are laid down in winter.

*Early King*.—The canes are of strong, vigorous, upright growth, and productive. The fruits are large, of good quality and soft when ripe. As the variety is early, it is well worthy of extensive trial. In 1896-7 it badly winter killed.

*Early Mammoth*.—Canes are of good growth, rather spreading and quite thorny. Fruits are large, long conical and of good quality. This was the first year of fruiting and the fruits were borne on long stems two to three inches long, and scattered singly all along the branch. As the berries were not in clusters, but few were produced. Perhaps the character of fruit-bearing may change when the plants are older.

*Eldorado*.—The cane growth is of the same general habit as the *Snyder*, though the leaflets are smaller, longer and narrower; the spines are scarcely so long or sharp and the older canes have more of a reddish tinge. The fruits are quite similar in appearance and quality. The past season *Eldorado* ripened a little earlier than the *Snyder*.

*Lincoln*.—Canes of strong growth, usually light green with slight reddish tinge; spines long and sharp; leaflets large. A few fruits are large, round conical and have very large seeds. The great majority of the fruits are small and imperfectly formed, and drop very easily before fully ripe. A very productive variety, but the fruits are small and poor in quality.

*Ohmer*.—Bore its first fruits this year and requires further trial.

*Snyder* and *Taylor* are old and well tried sorts that can usually be relied upon to produce good crops of fruit.

*Agawam, Early Cluster, Erie, Ford No. 1, Jewett, Kittatinny, Lovett, Minnewaski, Stone's Hardy, Wachusett and Wilson Jr.*, while possessing some good qualities, are either lacking in hardiness, are unproductive, or the fruits are too small to sell well in market.

*Childs' Everbearing and White Blackberry* were killed nearly to the ground and no fruit was borne.

## GRAPES.

The season of 1897 was very favorable for the grape and nearly all varieties of bearing age gave promise of a large crop of fruit. Owing however, to the numerous depredations committed, it was impossible to get full notes on the time of ripening, quality and productiveness of all sorts grown. A table of varieties is therefore omitted and the following brief notes given.

*Berckmans.*—The vine was productive, and the clusters, while not large are of good form and compact. The grapes are medium in size, round and a light purplish red color. The berries hang well to stem but are of medium quality. Season with *Concord*.

*Brighton.*—This is one of the leading red grapes for home use or market. The canes are productive and the fruit and foliage usually quite free from disease.

*Chidester No. 4.*—Much like *Concord* but a little later in season and the grapes larger. A variety of much promise.

*Delaware.*—An old sort somewhat liable to mildew but the quality is so superior that the variety should have a place in every home vineyard. Season a week later than *Concord*.

*Diamond.*—The variety is hardy and productive. Clusters large and compact. The grapes are good size, yellowish green color and of good quality. Season a week earlier than *Concord*. A good sort for the home plantation.

*Early Victor.*—The canes are of good growth, healthy and productive. The bunches are not large and the grapes are of medium size, blue-black in color and of good quality. The variety is about two weeks earlier than *Concord*, and is worthy of a place in the home vineyard.

*Empire State.* One of the leading white market grapes. It is not so large in bunch or berry as *Niagara*, but is better in quality.

*Geneva.*—Healthy and productive. The bunch is of medium size but good form. Berry medium to large, light green in color and of good quality. In season a little earlier than *Concord*. Worthy of trial as a home grape.

*Hayes.*—The clusters are of medium size, quite close and compact. The berries are a rich golden yellow color and very good in quality. Lacking in productiveness, otherwise a fine table sort.

*Janesville.*—Healthy and productive. Clusters small and compact. Berry of medium size, black and of fine quality. Too small in bunch and berry to be a profitable sort. It is two or three weeks earlier than *Concord*.

*Moore Early.*—The variety most largely grown as an early market grape. Season two weeks earlier than *Concord*. The variety is moderately productive; the clusters are of medium size, and the grapes are large, but the quality is rather low.

*Niagara*.—The leading white market grape. It is vigorous in growth, healthy and productive. The clusters and berries are large and the quality good. It is a little later than *Concord*.

*Focklington*.—An excellent yellowish-white grape; a little earlier in season than *Niagara* and the clusters and berries are smaller in size. The quality is better than that of *Niagara*, except that the flavor is quite foxy.

*Rockwood*.—Clusters small and quite compact. Berries of medium size, blue-black color and of good quality. It is two weeks earlier than *Concord* and has a place in a small way because of its earliness and quality.

*Vergennes*.—The growth is vigorous and healthy in foliage and fruit. Clusters of good size and compact in form. Berry large; color dark purple with green markings; quality good. The season is a little later than *Concord*. It is a valuable variety because of its good keeping qualities.

*Winchell*.—The variety is healthy in fruit and foliage. Clusters of good size and compact in form. Berry of medium size, round, color light green, skin thin but firm, pulp sweet, melting and of very fine quality. The variety is fairly productive and two to three weeks earlier than *Concord*. Valuable for home use and of considerable promise as an early market grape.

*Worden*.—This variety is from a week to ten days earlier than *Concord*, fully as productive and better in quality. This sort should be in every vineyard whether planted for home use or market.

Munson's No. 2, No. 32, No. 38 and No. 61 have been grown for several seasons. The vines are very productive, but the clusters are small, the grapes *very* small, sour and quite late to ripen. The varieties are subject to *Phylloxera* and have little value in this section.

L. R. TAFT,  
H. P. GLADDEN.

AGRICULTURAL COLLEGE, MICH.,  
December 1, 1897.



## REPORT OF SOUTH HAVEN SUB-STATION.

*Prof. L. R. Taft, Horticulturist:*

SIR—In submitting the following report of operations at this sub-station, during the portion of the year 1897 already elapsed, I take occasion to state that, owing doubtless to the exhaustion consequent upon the excessive crop of last year, together with the unusually prevalent low temperatures of the past spring, the fruit crop at this sub-station has, in very many cases, failed to fulfil even its early promise.

Snow fell here, in considerable quantity, as late as April 20, disappearing very slowly, the mercury ranging as low as 21° on the morning of the 21st. The weather continued cold, dry and otherwise unfavorable most of the time, till near the middle of June, at about which time the first copious rains occurred.

A careful examination by yourself, in March last, having betrayed the presence of San Jose scale upon a couple of small pear trees, planted in the spring of 1896, they were at once treated, under your direction, with an application of undiluted kerosene, which effectually exterminated the pest with no apparent injury to the tree-growth, which, at the time, was entirely dormant.

Your examinations at that time also betrayed a considerable prevalence of the Putnam scale. This was, therefore, at once treated with a thorough application of an emulsion of kerosene and whale oil soap, under your direction and supervision, which proved very effective.

In this report, as in preceding ones, the rules of Pomology of the American Pomological Society, which are also adopted by the National Division of Pomology, are as far as practicable applied to the names of the fruits reported.

In applying the spirit as well as the letter of these rules, we are antagonized by several more or less objectionable practices, now common among the originators and introducers of new varieties, and which too frequently prove sources of error in nomenclature, with multiplication of synonyms, and occasionally of objectionable prolixity in names.

Among these we note the following:

1. The disseminating of varieties under numbers, or under the originator's name, with a number attached, which, when permanently named, too frequently becomes the occasion, if not of error, at least of a multiplication of synonyms.

2. The use of coarse, rowdyish, pretentious or sensational names not unfrequently applied with the apparent purpose of promoting sales, with no apparent regard to actual value.



3. The application of specific titles to mere varieties, as in the case of *Prunus Pissardi* plum.

4. The yet more recent practice of combining the names of two varieties, or even species, and applying such compound name to a variety, notable cases of which occur in Bartlett-Seckel and Worden-Seckel pears, which are paralleled in the name, Dana-Hovey, applied to a fine pear; coupling the name of the originator with that of a noted pomologist, long since deceased.

So seriously objectionable are each and all these practices, that it becomes highly important that they, by some means, be promptly and effectively checked.

The rules, as well as the practice, of both the Society and the Division, accord to the originator the prior right to name his origination; but, at the same time, reserve the right to insist that such name shall be in accordance with the rules.

It is understood to be the practice of the National Division of Pomology to require compliance with such rules, before accepting a new fruit for entry upon its records.

Important and effective as such action unquestionably is, it can be but partially successful without the coöperation of other and similar influences.

It is perhaps too much to expect that the catalogues and horticultural serials of the day can be, to any considerable extent, induced to adopt the practice indicated, but a concurrent refusal by the Experiment Stations of the day, to give publicity to new varieties, until named in compliance with the prescribed rule, coupled with the known practice of the Division of Pomology, could scarcely fail to insure a very general acceptance and adoption of the desired practice.

#### STRAWBERRIES—*Fragaria*.

The Station grounds are now so densely planted with fruit trees, that the last three plantings of strawberries have unavoidably been made upon ground partially or wholly preoccupied by fruit trees; more or less of them of bearing age.

Under such conditions, it is assumed that the weight or bulk of the crop cannot fairly express the value of a variety, as compared with others grown under more favorable conditions. For this reason the vigor and productiveness of varieties, as compared with others grown under similar conditions, are estimated upon the scale—1 to 10.

A straw mulch was applied late last autumn, for winter protection, and the plants were sprayed last spring, after removing the mulch, as a preventive against the depredations of insects and fungi, from which, however, the plantations have been notably exempt; the chief exception being the minute larva, commonly known as the *midge*, which, however, yielded to an application of tobacco water, which was applied June 5th. In the last spring's plantation, also a considerable number of plants were destroyed by the grub (*Lachnosterna fusca*), and were at once replaced.

The very warm, dry weather of late June and early July rapidly deteriorated the remainder of the strawberry crop, so that the last picking was made on July 6th, when the one and two year plats (the latter having been fruited the second year for the purpose of comparison), were at once plowed under.

The ground from which the old small fruit plat had been recently removed should doubtless have been liberally manured, and cultivated at least a year before being replanted. But this being the only available ground for the purpose, it was prepared and planted with strawberries last spring, after receiving a light application of unleached ashes—all that could be obtained for the purpose, at the time, and chemical fertilizers.

The weather continuing very warm and dry, on July 19th to 23d, the plat was irrigated from the village water mains by means of a hose, and again on the 28th to 31st.

Taken as a whole, the season can scarcely be considered a favorable one for the strawberry, though a timely rain during the earlier part of the ripening season would probably have added largely to the yield.

Of the numerous varieties of strawberries now before the public, few if any have been carefully described, either by the originators or introducers. Under such circumstances, the receiver of a, to him, unknown novelty, must necessarily depend implicitly upon the correctness and veracity of the person from whom he receives it, so far as its genuineness is concerned. Indeed, so readily is the public accustomed to accept alleged novelties that, in very many cases, the same description would suffice, almost equally well, for a very considerable number of varieties.

It is suggested, that a large expenditure upon worthless novelties would be saved, were the public to require that novelties shall only be accepted upon a description, showing superior and valuable qualities.

As a step toward the accomplishment of this object, the descriptions of both plant and fruit, in the following tabulation, are made as full and minute as practicable, within the space that can be devoted to such purpose, the estimates being made upon the scale—1 to 10, with 10 as the maximum.

Tabulation of Strawberries, 1897.

Abbreviations: b, bisexual; n, nearly; p, pistillate; c, conical; co, compressed; l, irregular; l, long; o, oblate; ob, oblong; r, round; b, bright; c, crimson; d, dark; l, light; s, scarlet. Scale: 1 to 10; 1, feeble; 10, very vigorous.

No.	Names.	Plant.				Fruit.				Remarks.			
		Sex.	Vigor. (1-10)	Date of Bloom.	Date of first picking.	Date of last picking.	Product.	Form.	Color.		Quality. (1-10)	Texture. (1-10)	Weight. Ounces.
1	Acorn.....	b	9	May 12	June 15	July 6	5	ro	ls	5	6-7	$\frac{1}{2}$	Strong, upright.
2	Allen.....	p	7	" 17	" 24	" 24	8	roco	c	6-7	8	$\frac{1}{2}$	Tall, upright, rather weak.
3	Allen.....	p	6	" 12	" 19	" 6	9	ob	c	7	6	$\frac{1}{2}$	Low, spreading, rather weak.
4	Allen, 5.....	p	6	" 17	" 17	" 2	4	ro	c	8	7	$\frac{1}{2}$	Low, spreading, strong.
5	Allen, 6.....	p	7	" 17	" 24	" 2	5	ro	c	5-6	5	$\frac{1}{2}$	Upright, spreading, strong.
6	Allen, 13.....	p	7	" 18	" 22	" 2	8	tc	c	8-9	8	$\frac{1}{2}$	Low, spreading, weak.
7	Annie Laurie.....	b	5	" 21	" 26	" 6	4	ro	c	6-7	10	$\frac{1}{2}$	Low, spreading, weak.
8	Arona.....	b	7	" 18	" 21	" 6	9	ro	c	3-4	4-5	$\frac{1}{2}$	Tall, spreading, strong.
9	Arrow.....	p	8	" 18	" 25	" 6	4	ro	ds	3-4	4	$\frac{1}{2}$	Tall, upright, strong.
10	Arburn.....	p	6	" 18	" 24	" 2	6	ro	c	7-8	9 10	$\frac{1}{2}$	Tall, upright, weak.
11	Banquet.....	p	4	" 14	" 22	" 6	4	ro	ds	6 7	7-8	1-3	Tall, upright, weak.
12	Barton.....	p	5	" 13	" 24	" 6	7	coo	ls	4-5	7	$\frac{1}{2}$	Tall, upright, strong.
13	Beebe.....	p	6	" 17	" 26	" 2	6	roco	ds	3-4	4	$\frac{1}{2}$	Tall, upright, strong.
14	Beecher.....	b	10	" 18	" 22	" 6	9	rob	c	4-5	4	$\frac{1}{2}$	Low, spreading, strong.
15	Belt, 3 (Wm. Belt).....	b	8	" 15	" 22	" 6	9	c	s	4-5	6	$\frac{1}{2}$	Tall, spreading, strong.
16	Beverly.....	b	7	" 18	" 22	" 6	10	ro	bs	6-7	8	$\frac{1}{2}$	Low, strong, spreading.
17	Hickle.....	p	5	" 16	" 22	" 6	4	ro	s	4-5	7	1-3	Low, weak, spreading.
18	Boynton.....	p	10	" 17	" 22	" 6	9	ro	s	6-7	7	1-3	Tall, upright, weak.
19	Brandywine.....	p	10	" 18	" 22	" 6	10	ro	dc	4-5	9	$\frac{1}{2}$	Low, spreading, strong.
20	Brunette.....	p	8	" 17	" 22	" 6	8	ro	dc	9-10	9	$\frac{1}{2}$	Tall, spreading, strong.
21	Bubach, 5.....	p	9	" 18	" 24	" 6	7	roco	s	4-5	4	$\frac{1}{2}$	Tall, strong, upright.
22	Cameron, 2.....	p	6	" 13	" 17	" 2	6	roco	s	6-7	6	$\frac{1}{2}$	Tall, upright, strong.
23	Cameron, 6.....	p	6	" 17	" 17	" 2	3	ro	c	3	6	$\frac{1}{2}$	Tall, upright, strong.
24	Cameron, 13.....	p	6	" 19	" 26	" 6	7	ro	s	4-5	8	$\frac{1}{2}$	Tall, upright, strong.
25	Carrie.....	p	7	" 19	" 26	" 6	5	roco	s	3-4	5	$\frac{1}{2}$	Tall, upright, strong.
26	Chairs.....	p	7	" 17	" 17	" 6	6	ro	s	5	4	$\frac{1}{2}$	Tall, upright, strong.
27	Champion (Eng.).....	p	9	" 19	" 28	" 6	10	roco	s	3-4	6-7	$\frac{1}{2}$	Low, spreading, rather weak.
28	Charlie.....	p	10	" 17	" 22	" 6	8	ro	s	4-5	8	$\frac{1}{2}$	Tall, upright, rather strong.
29	Cheyenne.....	p	7	" 19	" 26	" 6	6	roco	s	6-7	8	$\frac{1}{2}$	Low, spreading, weak.
30	Clark.....	p	6	" 17	" 22	" 2	5	ro	c	6-7	8	$\frac{1}{2}$	Low, spreading, weak.
31	Cleveland.....	p	7	" 18	" 22	" 6	7	roco	s	4-5	5	$\frac{1}{2}$	Low, spreading, strong.
32	Columbia.....	p	6	" 19	" 22	" 6	10	ro	s	4-5	4	$\frac{1}{2}$	Low, spreading, rather weak.
33	Consensus.....	p	7	" 20	" 26	" 6	8	roco	c	8-9	8	$\frac{1}{2}$	Tall, upright, strong.
34	Copernicus.....	p	8	" 19	" 22	" 6	9	ro	c	4-5	8	$\frac{1}{2}$	Tall, upright, strong.
35	Crescent.....	p	9	" 17	" 22	" 6	9	ro	s	4-5	4-5	$\frac{1}{2}$	Tall, upright, strong.
36	Cruise.....	p	7	" 17	" 22	" 6	7	roco	ls	5	9	$\frac{1}{2}$	Low, spreading, strong.

33	Curtis, 15.	7	"	17	"	18	"	6	6	8	roo	s	5	6	1/2	Tall, upright, strong.
34	Curtis, 15.	7	"	17	"	22	"	6	6	8	oboo	s	5	6	1/2	Tall, upright, strong.
35	Cyrene.	6	"	15	"	21	"	2	2	5	coo1	o	5	7	1/2	Tall, upright, weak.
40	Delay.	6	"	21	"	24	"	6	6	4	rooo	ds	6	8	1/2	Tall, upright, strong.
41	Den Biel.	10	"	14	"	21	"	6	6	10	rooo	ds	8		1/2	Tall, upright, strong.
42	Dayton.	9	"	18	"	14	"	6	6	9	ci	ds	6-7	4-5	1/2	Low, spreading, strong.
43	Earliest.	9	"	12	"	15	"	6	6	9	rooo	s	6-7	10	1/2	Tall, upright, strong.
44	Early Jack.	8	"	15	"	22	"	6	6	7	roo1	s	4-5	5	1/2	Tall, upright, weak.
45	Edgar.	7	"	17	"	23	"	6	6	9	ro1	ds	3-4	4	1/2	Low, upright, strong.
46	Edgar.	7	"	17	"	23	"	6	6	9	roo1	ds	3-4	4	1/2	Low, upright, strong.
48	Edith.	6	"	21	"	28	"	6	6	6	rooo	o	8-9	7	1/2	Low, spreading, strong.
47	Edward (Fav.).	6	"	19	"	26	"	6	6	7	ro	ds	6-7	7	1/2	Short, spreading, weak.
48	Edwards.	6	"	13	"	23	"	6	6	8	ro1	ls	5	5	1/2	Low, spreading, weak.
49	Eleanor.	6	"	14	"	20	"	6	6	8	ro1	o	6-7	8	1/2	Low, spreading, strong.
50	Kabane.	6	"	17	"	23	"	6	6	7	ro1	o	9	10	1/2	Tall, upright, weak.
51	Epping.	7	"	12	"	15	"	6	6	4	oo1	o	3-4	3	1/2	Tall, spreading, strong.
52	Fairmount.	8	"	17	"	18	"	6	6	10	rooo	s	7-8	6	1/2	Tall, upright, weak.
53	Feicht, 2.	7	"	13	"	23	"	2	2	5	ro1	s	5	8	1/2	Low, upright, strong.
54	Feicht, 3.	7	"	18	"	26	"	6	6	6	ci	o	2-4	3	1/2	Tall, spreading, strong.
55	Fir.	7	"	19	"	23	"	2	2	3	ro	s	6-7	8	1/2	Low, spreading.
56	Gardner.	7	"	18	"	23	"	2	2	6	oo	o	4-5	6	1/2	Tall, upright, strong.
57	Gipsy.	8	"	16	"	24	"	6	6	6	ci	c	9-10	9	1/2	Low, upright, strong.
58	Glenfield.	5	"	15	"	23	"	2	2	8	ro	c	6-7	8	1/2	Low, spreading, weak.
59	Greenville.	10	"	17	"	23	"	6	6	9	rooo	c	3-4	4-5	1/2	Tall, upright, spreading.
60	Harmon.	8	"	14	"	14	June 28	6	6	4	o	c	9-10	3	1/2	Tall, upright, strong.
61	Hattie.	7	"	17	"	23	July 6	6	6	7	ro1	s	3-4	4	1/2	Tall, upright, spreading, strong.
62	Haverland.	8	"	13	"	23	"	6	6	7	oboo	s	8-9	7-8	1/2	Tall, upright, strong.
63	Hermitt.	8	"	17	"	23	"	6	6	8	ro1	s	5-6	7	1/2	Tall, upright, strong.
64	Holland.	9	"	21	"	23	"	6	6	5	rooo	c	3-4	4	1/2	Tall, upright, strong.
65	Hugo.	9	"	18	"	23	"	2	2	4	ro1	c	5	8	1/2	Low, spreading, weak.
66	Hundman.	6	"	19	"	24	"	2	2	5	r	c	6-7	9-10	1/2	Low, spreading, strong.
67	Hyslop.	7	"	13	"	14	June 28	6	6	5	ro	ds	6-7	5-6	1/2	Tall, upright, strong.
68	Iowa.	7	"	15	"	23	"	6	6	8	oboo	c	4-5	6	1/2	Low, spreading, strong.
69	Irene.	2	"	15	"	23	"	6	6	10	coo1	c	6-7	8	1/2	Low, spreading, strong.
70	Isabel.	9	"	21	"	19	July 6	6	6	9	coo1	c	6	9	1/2	Tall, upright, weak.
71	J. S. 4.	8	"	17	"	23	"	6	6	9	rooo	s	5-6	7	1/2	Tall, upright, rather weak.
72	J. S. 6.	5	"	17	"	26	"	6	6	8	ro	s	7-8	7	1/2	Low, spreading, weak.
73	Kansas.	6	"	17	"	23	"	2	2	7	ro	s	5-6	7	1/2	Tall, upright, weak.
74	Kate.	6	"	18	"	23	"	6	6	10	ro	s	3-4	8	1/2	Tall, upright, strong.
75	Kiekitka.	7	"	19	"	23	"	6	6	6	ro1	s	7	8	1-3	Upright, tall, strong.
76	Koesuth.	7	"	15	"	23	"	2	2	10	ro1	s	5	4-5	1/2	Low, spreading, weak.
77	Kyle, 1.	10	"	18	"	24	"	6	6	8	roo	o	4-5	4	1/2	Tall, upright, strong.
78	La Crose.	6	"	16	"	25	"	6	6	6	ro	s	7-8	7	1/2	Tall, upright, strong.
79	Leader.	7	"	15	"	25	"	2	2	4	ro	o	9	9	1/2	Low, spreading, strong.
80	Leslie.	7	"	17	"	23	"	6	6	7	ci	ds	5-6	7	1-3	Tall, upright, strong.
81	Leroy.	8	"	17	"	23	"	6	6	8	ro	s	6-7	4	1/2	Tall, upright, strong.
82	Leviathan.	5	"	19	"	23	"	2	2	7	oo	s	4-5	4	1/2	Low, spreading, strong.

Tabulation of Strawberries, 1897.—Continued.

No.	Names.	Plant.				Fruit.				Remarks.		
		Sex.	Vigor. (1-10)	Date of Bloom.	Date of first picking.	Product.	Form.	Color.	Quality. (1-10)		Texture. (1-10)	Weight. Ounces.
83	Lincoln.....	P	8	May 18	June 23	9	cl	s	5-6	5	$\frac{3}{4}$	Tall, upright, strong.
84	Little, 28.....	n, p	10	" 19	" 28	10	roo	c	7-8	7-8	$\frac{3}{4}$	Tall, upright, strong.
85	Little, 42.....	P	7	" 17	" 23	8	ro	c	7-8	7-8	$\frac{3}{4}$	Short, spreading, strong.
86	Longfield.....	P	8	" 17	" 19	8	ro	c	7	8	$\frac{3}{4}$	Tall, upright, strong.
87	Lovett.....	P	7	" 18	" 19	10	ooo 1	c	7-8	8	$\frac{3}{4}$	Short, upright, rather weak.
88	Lower.....	b	7	" 17	" 25	7	roco	c	4-5	8	$\frac{3}{4}$	Tall, upright, spreading, strong.
89	Magnate.....	P	8	" 18	" 23	6	roco	s	5-6	7	$\frac{3}{4}$	Tall, upright, strong.
90	Marshall.....	P	8	" 15	" 24	8	ooo 1	c	5-6	8	$\frac{3}{4}$	Tall, upright, strong.
91	Mary.....	P	6	" 19	" 25	5	ro	dc	5-6	6-7	$\frac{3}{4}$	Tall, upright, strong.
92	Maxwell.....	P	5	" 13	" 23	4	ro	ds	4-5	6	$\frac{3}{4}$	Tall, upright, strong.
93	Mayflower.....	b	8	" 10	" 24	7	ro	s	6-7	6-7	$\frac{3}{4}$	Tall, upright, rather weak.
94	Meeks.....	b	7	" 13	" 23	5	oooo	c	4-5	8	$\frac{3}{4}$	Tall, spreading, strong.
95	Miller.....	b	8	" 22	" 25	9	ro	c	5-6	8	$\frac{3}{4}$	Tall, upright, strong.
96	Murray.....	p	6	" 22	" 22	5	roco	s	4-5	8	$\frac{3}{4}$	Tall, upright, weak.
97	Muskingum.....	b	10	" 21	" 23	10	ooo	c	7-8	8	$\frac{3}{4}$	Tall, strong, slightly spreading.
98	Mystic.....	b	7	" 20	" 25	10	roco	ds	3-4	8	$\frac{3}{4}$	Low, spreading, strong.
99	Noble.....	b	2	" 13	" 25	1	ro	s	2-3	4	$\frac{3}{4}$	Low, spreading, strong.
100	No. 31.....	b	7	" 19	" 24	30	roco	c	9-10	9	$\frac{3}{4}$	Tall, spreading, upright, strong.
101	Odessa.....	P	8	" 18	" 28	6	roco	ds	4-5	8	$\frac{3}{4}$	Tall, upright, strong.
102	Ohio Centennial.....	P	7	" 17	" 25	8	ro 1	ds	3-4	4	$\frac{3}{4}$	Low, spreading, strong.
103	Ona.....	P	8	" 18	" 23	7	ro	s	5-6	7	$\frac{3}{4}$	Tall, upright, strong.
104	Orange Co.....	P	5	" 17	" 22	6	r	c	5-6	6	$\frac{3}{4}$	Tall, upright, strong.
105	Oregon 273.....	P	5	" 17	" 23	6	roco	s	4-5	7	$\frac{3}{4}$	Low, spreading, weak.
106	Orono.....	P	6	" 17	" 24	4	roco	c	6-7	5	$\frac{3}{4}$	Tall, upright, weak.
107	Oscar.....	P	5	" 20	" 26	5	roco	c	8-9	8	$\frac{3}{4}$	Low, spreading, strong.
108	Osteo.....	P	8	" 17	" 26	5	r	s	4-5	6	1-5	Tall, upright, spreading, strong.
109	Pacific.....	P	8	" 17	" 23	7	ro 1	s	5-6	5	$\frac{3}{4}$	Tall, upright, strong.
110	Paris (King).....	P	8	" 17	" 1 <sup>st</sup>	8	roco	ls	6	8	$\frac{3}{4}$	Low, spreading, weak.
111	Parker Earle.....	b	8	" 17	" 25	10	roco	ds	4-5	5	$\frac{3}{4}$	Tall, upright, strong.
112	Pawnee.....	P	7	" 17	" 23	8	roco	lc	6-7	8	$\frac{3}{4}$	Tall, upright, spreading, strong.
113	Philip.....	P	9	" 17	" 23	10	ro 1	c	5-6	8	$\frac{3}{4}$	Tall, upright, strong.
114	Philpen.....	b	8	" 17	" 21	5	ro 1	c	6-7	9	1-6	Tall, upright, rather weak.
115	Plow City.....	b	5	" 18	" 26	3	-----	s	3-4	8	$\frac{3}{4}$	Tall, upright, strong.
116	Premium.....	b	7	" 19	" 28	1	-----	-----	-----	8	-----	-----
117	Price.....	b	8	" 13	" 23	10	roco	s	4-5	10	$\frac{3}{4}$	Tall, upright, strong.
118	Primata.....	b	8	" 13	" 23	7	ro	c	8-9	7	$\frac{3}{4}$	Short, upright, strong.
119	Princess.....	b	8	" 12	" 23	4	roco	s	4-5	4	$\frac{3}{4}$	Tall, upright, spreading, strong.
120	Princeton.....	P	9	" 12	" 25	5	ro	s	3-4	5	$\frac{3}{4}$	Tall, upright, strong.

121	Richmond	b	6	"	13	"	23	"	6	9	ooo	d	7-8	9	1/2	Low, spreading, weak.
122	Rio	b	7	"	10	"	23	"	2	9	ro	s	7-8	9	1-5	Tall, upright, strong.
123	Robinson	b	8	"	17	"	25	"	6	9	rooo	s	5-6	9	1/2	Tall, upright, strong.
124	Ruby	b	8	"	13	"	23	"	6	9	rooo	c	5-6	9	1/2	Tall, upright, strong.
125	Sandoval	b	5	"	17	"	23	"	6	6	ooo	d	8-9	8	1/2	Low, spreading, weak.
126	Saunders	b	10	"	17	"	23	"	6	10	rooo	c	10	10	1/2	Tall, spreading, strong.
127	Scarlet Ball	b	10	"	13	"	23	"	6	6	ri	s	6-7	7	1/2	Tall, upright, strong.
128	Sharples	b	9	"	18	"	23	"	6	8	ooo	c	8-9	5	1/2	Tall, spreading, strong.
129	Shawnee	b	10	"	15	"	23	"	6	9	ro	d	4-5	5	1/2	Low, spreading, strong.
130	Sherman	b	9	"	13	"	22	"	6	10	r	ls	5-6	9	1/2	Tall, spreading, strong.
131	Shuckless	b	8	"	17	"	23	"	6	7	ro	c	5-6	7	1/2	Tall, upright, spreading, strong.
132	Smalley	b	9	"	16	"	23	"	6	10	ro	s	3-4	7	1/2	Tall, upright, strong.
133	Smeltzer	b	6	"	12	"	23	"	23	7	ro	c	8	7	1/2	Tall, upright, strong.
134	Smith	b	9	"	10	"	23	"	2	8	rooo	s	3-4	4	1/2	Tall, upright, strong.
135	Snowball	b	10	"	17	"	19	"	6	7	ro	s	4-5	8	1/2	Tall, upright, strong.
136	Southard	b	8	"	12	"	23	"	2	5	ri	s	7-8	7	1/2	Low, spreading, weak.
137	Speece	b	6	"	17	"	23	"	6	6	ro	c	5-6	6	1/2	Tall, spreading, strong.
138	Splendid	b	8	"	15	"	23	"	6	8	ro	s	3-4	3	1/2	Tall, spreading, strong.
139	Springdale	b	7	"	18	"	23	"	6	10	lc	c	5-6	8	1/2	Low, spreading, strong.
140	Stahelin	p	9	"	10	"	23	"	2	6	oi	lc	5	5	1/2	Tall, upright, spreading, strong.
141	Standard	b	10	"	15	"	23	"	6	9	ro	s	2-3	6	1/2	Low, spreading, strong.
142	Staples	b	9	"	17	"	23	"	6	7	ro	d	7-8	7-8	1/2	Low, spreading, strong.
143	Stewart	b	10	"	10	"	15	"	6	6	rooo	s	5	9	1/2	Tall, upright, strong.
144	Sunnyside	b	10	"	17	"	22	"	6	6	ro	s	2-3	3	1/2	Tall, upright, spreading, strong.
145	Surprise	b	8	"	17	"	25	"	6	6	ro	c	3-4	6	1/2	Tall, upright, strong.
146	Swindle	p	10	"	17	"	25	"	6	7	ro	s	4-5	8	1/2	Tall, upright, strong.
147	Tennessee	p	7	"	15	"	23	"	6	6	ro	c	7	6	1/2	Tall, upright, strong.
148	Thompson 40	p	9	"	17	"	25	"	6	5	ro	s	4-5	6	1/2	Tall, upright, strong.
149	Thompson 66	p	9	"	19	"	25	"	6	4	r	c	4-5	7	1-5	Tall, upright, rather weak.
150	Timber	p	6	"	20	"	25	"	6	7	oi	c	8	8	1/2	Tall, upright, strong.
151	Tom Walker	p	9	"	15	"	25	"	6	7	ro	c	4-5	6	1/2	Tall, upright, weak.
152	Tonga	p	8	"	12	"	25	"	6	6	ro	c	7-8	7	1/2	Rather low, upright, strong.
153	Topeka	b	8	"	15	"	23	"	6	8	lcoo	d	4-5	8	1/2	Tall, upright, strong.
154	Tubbs	b	8	"	13	"	29	"	June 30	5	ro	d	4-5	4	1/2	Tall, upright, strong.
155	Van Daman	b	8	"	10	"	19	"	6	10	oi	c	10	8	1/2	Tall, upright, strong.
156	Warfield	p	8	"	17	"	25	"	6	9	ooo	c	6-7	6	1/2	Tall, upright, rather weak.
157	Watson	p	8	"	17	"	25	"	6	7	ro	d	2-3	4	1/2	Low, spreading, strong.
158	Weston	p	7	"	17	"	26	"	6	8	ro	c	3-4	8	1/2	Tall, upright, rather weak.
159	Williams	p	10	"	20	"	23	"	6	10	rooo	c	9-10	9-10	1/2	Low, spreading.
160	Wilson	b	9	"	17	"	23	"	6	10	ro	s	5-6	9	1/2	Low, spreading, strong.
161	Wood (Beder)	b	9	"	17	"	25	"	6	10	ro	s	3-4	4-5	1/2	Tall, rather spreading, strong.
162	Woolvorton	b	9	"	20	"	23	"	6	10	ro	c	9	9	1/2	Low, spreading, strong.
163	Wyatt	b	7	"	17	"	22	"	6	6	ro	c	5-6	8	1/2	Tall, upright, strong.

The dates of the blooming and ripening of strawberries, as has been already stated, have been unusually modified by climatic causes. While occasional varieties struggled into bloom during the unusually cool weather of early May, the sudden advent of very warm weather soon after, forced the delayed varieties into bloom almost in a mass.

The ripening season also, though dry, continued cool till near the end of June, when, though still dry, it suddenly became very warm, with the effect that much of the yet unripe fruit was dried upon the vines, thus bringing the picking season to a premature close. The estimates of productiveness, under these conditions, are to be understood as essentially a comparison of results, between the varieties tabulated during the current season.

Of the varieties betraying lack of vigor, sixteen are pistillate or nearly so, and the remaining twenty-one are bisexual, thus giving a slight preponderance to the popular assumption, that the non-production of pollen conserves the vigor, or ultimates in increased productiveness.

Of the 163 varieties tabulated, 124 rank above medium, so far as productiveness is concerned, while only 37 equal or exceed the old Wilson in quality, when grown under the same conditions.

The tabulation includes forty-five varieties graded as high as nine for productiveness, while of these four only rank as high as nine in quality, with five others in the tabulation, of equal quality, but more or less deficient in productiveness—a not very creditable comment upon the greed of buyers and consumers for size and quantity, in disregard of quality, as well as on the strife of growers for present returns, in disregard of ultimate reputation and profit.

Owing, apparently, to exceptional climatic influences, a considerable number of varieties which have been for a considerable time on trial without specially favorable results, have this season been unusually productive.

The following is an abstract of the grading for quality of those ranking nine to ten for productiveness:

2 to 3—Standard.

3 to 4—Aroma, Champion (Eng.), Edgar, Greenville, Katie, Mystic, Smalley and Wood (Beder).

4 to 5—Beecher, Belt 3, Brandywine, Columbia, Crescent, Parker Earle, Price and Shawnee.

5—Kossuth.

5 to 6—J. S. 4, Lincoln, Miller, Philip, Robinson, Ruby, Sherman, Springdale and Wilson.

6—Isabel.

6 to 7—Beverly, Boynton, Dayton, Irene and Warfield.

7—Allen.

7 to 8—Fairmount, Little 26, Lovett, Muskingum, Richmond and Rio.

8—Bisel.

9—Woolverton.

9 to 10—Williams.

10—Saunders and Van Deman.

Of the varieties with a favorable record for the past trying season, and which bring a promising record from previous trials, we may name Warfield, as still maintaining its previous standing, together with the comparatively recent varieties—Isabel (No name), sent out by Thompson's Sons,

Rio Vista, Va., and Saunders and Woolverton, two recent seedlings, originated by Mr. John Little of Ontario. The last three seem worthy of trial, as market varieties.

RASPBERRIES.—*Rubus*.

As a means of avoiding the intermixing of the suckering varieties, these are planted in plats alternating with blackberries and blackcaps.

The raspberries, in common with the entire plantation, received a spray of strong copper sulphate dissolved in water, while yet dormant, as a preventive of fungus, which has been notably absent, with the exception of a slight attack of anthracnose, which was promptly treated with a spray of Bordeaux.

Insects also have been notably absent, so far as this fruit is concerned.

The early promise of fruit was very good; but the occurrence of hot, dry weather during the ripening season, dried and nearly or quite ruined a large share of the crop, though a copious rain came in time to save a portion of such varieties as were not already past recovery.

The weight of an average berry is given in fractions of an ounce.

Productiveness and quality are expressed upon the scale, 1 to 10; the latter being the maximum.



Tabulation of Raspberries, 1897.

Abbreviations: c, conical; o, oblate; ob, oblong; r, roundish; b, blackish; p, pubescent; pu, purplish; r, red; y, yellow.

No.	Names.	Plant.				Fruit.				Remarks.	
		Species.	Bloom.	First picking.	Last picking.	Product	Form.	Color.	Av. berry in fractions of an inch. Weight.		Quality. (Scale 1-10.)
1	Ada	Occidentalis	June 17	July 13	Aug. 21	8	r c	c	1/4	7	Worthless.
2	Bradyvine	Strigosus	" 15	" 12	" 21	10	r c	c	1-20	6-7	Formerly popular for market.
3	Cardinal	Neglectus	" 12	" 12	" 29	10	r c	c	1-20	5	Both suckering and tiprooting.
4	Carman	Occidentalis	" 9	" 12	" 7	10	r	y	1-30	2-3	Not relatively valuable.
5	Caroline	Neglectus	" 9	" 12	" 7	10	r	y	1-30	2-3	Low quality; productive.
6	Centennial	Occidentalis	" 8	" 12	" 31	9-10	r	b	1-20	6-7	Not comparatively valuable.
7	Chaplain	Strigosus	" 8	" 12	" 31	9-10	r	b	1-20	6-7	Not yet in fruit.
8	Clark	Strigosus	June 9	July 13	Aug. 23	7	r	pu	1-15	7-5	A slender grower.
9	Clark	Occidentalis	June 9	July 13	Aug. 23	7	r	pu	1-15	7-5	Not yet fruiting.
10	Columbian	Neglectus	June 14	July 16	Aug. 13	7-8	r o	pu	1-16	3-4	For canning.
11	Cornath	Occidentalis	" 10	" 12	" 31	10	r	b	1-20	5	One of the earliest.
12	Cornwall	Occidentalis	" 7	" 10	" 27	10	r	b	1-20	5	Similar to the foregoing.
13	Cuthbert	Strigosus	" 9	" 13	" 13	6	c	c	1-14	6-6	Most popular of the reds.
14	Diamond	Occidentalis	" 10	" 16	" 6	7-8	r o	b	1-18	7-8	Promising.
15	Doolittle	Occidentalis	" 8	" 12	" 12	10	r	b	1-22	5-6	The pioneer blackcap.
16	Earhart	Occidentalis	" 8	" 12	" 27	9	r	b	1-25	5-6	Autumn fruiting.
17	Early King	Strigosus	" 7	" 12	" 13	7	r	r	1-15	7-8	New and very promising.
18	Emmett	Neglectus	" 15	" 13	" 2	8	r	pu	1-23	3-4	New.
19	Eureka	Occidentalis	" 10	" 12	" 31	10	r o	b	1-18	5-6	Very valuable.
20	Farnsworth	Occidentalis	" 8	" 12	" 6	10	r o	b	1-30	4-5	Promising.
21	Gault	Occidentalis	June 9	July 12	Aug. 29	7	r c	pu	1-32	4-5	Not yet fruited.
22	Gladstone	Neglectus	" 11	" 13	July 29	7	r c	pu	1-16	7-8	Double cropper, but worthless.
23	Golden Queen	Strigosus	" 11	" 12	July 29	10	r c	b	1-27	7-8	Excellent for home use.
24	Green	Occidentalis	" 4	" 13	Aug. 6	9	r o	p b	1-20	5-6	Of doubtful value.
25	Gregg	Occidentalis	" 11	" 14	Aug. 6	9	r o	p b	1-20	5-6	Productive. Plant tender.
26	Hansell	Strigosus	" 3	" 7	" 5	5	r	c	1-17	5-6	Earliest red variety.
27	Hersine	Idena herb.	" 7	" 10	Sept. 6	9-10	r o	r	1-13	9-10	Best red. Plant tender.
28	Hilborn	Occidentalis	" 10	" 12	Aug. 8	10	r o	b	1-29	5-6	Of superior quality.
29	Idaho	Occidentalis	" 12	" 17	Aug. 2	10	r o	b	1-14	5-6	Of doubtful value.
30	Indiana	Occidentalis	" 7	" 15	" 2	10	r o	b	1/2	5-6	Has not become popular.
31	Mayberry	Microphyllus	June 23	Aug. 2	Sept. 3	10	r o	r	1-40	1-2	Not yet fruited.
32	Japanese Wineberry	Phenocoleus	" 10	July 12	Aug. 31	10	r o	b	1-23	4-5	Very vigorous, but worthless.
33	Johnston	Occidentalis	" 10	" 12	Aug. 31	10	r o	b	1-23	4-5	Fruit too seedy.
34	Kansas	Occidentalis	" 10	" 12	" 27	6-7	r	r	1-13	4-5	Increasingly popular.
35	Kenyon	Strigosus	" 10	" 12	" 27	6-7	r	r	1-13	5-6	New, promising.

36	Logan.....	Herb. Ideus Uralinus	June 9	July 13	Aug. 31	6-6	r	r	1-15	4-5	Not yet fruiting.
37	London.....	Strigosus.....	June 10	" 13	" 31	10	r	r	1-30	5-6	Very promising.
38	Lovett.....	Occidentalis	" 9	" 10	" 9	8	r	r	1-16	5-6	Needs farther trial.
39	Marlboro .....	Strigosus Ideus.....	" 9	" 10	" 21	6-6	r o	r	1-15	7-8	Low quality. Market.
40	Miller.....	Strigosus.....	" 9	" 10	" 21	6-6	r o	r	1-15	7-8	New, very promising.
41	Mills 15.....	Occidentalis	" 10	" 17	" 5	10	r	b	1-18	6-7	New, needs farther trial.
42	Mnakingum.....	Neglectus.....	" 15	" 19	" 13	9-10	r o	pu	1-12	5-6	Much like Shaffer.
43	Nemaha.....	Occidentalis	June 7	July 12	Aug. 31	10	r	b	1-28	6-7	Not yet in fruit.
44	Ohio.....	Occidentalis	June 7	" 14	" 7	9-10	r	b	1-19	4-5	Good market blackcap.
45	Older.....	Occidentalis	June 15	July 19	Aug. 29	10	r	pu	1-13	4-5	Not yet well tested.
46	Onondaga.....	Neglectus.....	June 15	" 19	Aug. 29	10	r	b	1-28	7-8	Vigorous.
47	Otis.....	Occidentalis	" 8	" 12	" 9	5	r	b	1-15	5-6	Superior, early.
48	Palmer.....	Occidentalis	" 10	" 10	July 31	9-10	r	b	1-20	5-6	Needs farther trial.
49	Phoenix.....	Occidentalis	" 8	" 10	July 31	9-10	r	b	1-20	5-6	Nearly superseded.
50	Progress.....	Occidentalis	" 8	" 10	July 31	9-10	r	b	1-20	5-6	Nearly superseded.
51	Redfield.....	Neglectus.....	" 6	" 15	Aug. 2	9	r	pu	1-20	3-4	New, western.
52	Reeder.....	Strigosus.....	" 9	" 12	" 6	5-6	r o	r	1-17	8-9	Superior for desert.
53	Reliance.....	Strigosus.....	" 9	" 12	" 14	6-7	r	pu r	1-17	4-5	Acid. Very hardy.
54	Sarah.....	Strigosus.....	June 15	July 19	Aug. 13	10	r	pu	1-16	5-6	Not yet in fruit.
55	Shaffer.....	Neglectus.....	June 15	July 19	Aug. 13	10	r	pu	1-16	5-6	One of the best for canning.
56	Smith Giant.....	Occidentalis	June 10	July 15	July 31	7-8	r	b	1-22	7-8	Not fruiting.
57	Smith Proflific.....	Occidentalis	" 8	" 10	" 27	10	r	b	1-24	5-6	An Ontario seedling.
58	Souhegan.....	Occidentalis	" 23	" 29	Oct. 4	1	r o b	r	1-6	2-3	Old. Very early.
59	Strawberry-Raspb'y.....	Rosefolius.....	" 9	" 10	Aug. 2	6	r o b	r	1-10	4-5	A curiosity only.
60	Superlative.....	Ideus.....	" 9	" 7	" 6	6-7	r	r	1-22	4-5	Origin foreign.
61	Thompson.....	Strigosus.....	" 10	" 10	" 17	6-7	r	r	1-15	5-6	Of doubtful value.
62	Thwack.....	Strigosus.....	" 17	" 12	" 9	5	r o	r	1-22	5-6	A market variety.
63	Turner.....	Strigosus.....	" 8	" 10	July 31	10	r o	b	1-24	5-6	Nearly superseded.
64	Tyler.....	Occidentalis	" 7	" 12	" 27	6-7	r o	b	1-24	4-5	Like Souhegan.
65	Winona.....	Occidentalis	" 7	" 12	" 27	6-7	r o	b	1-24	4-5	Of uncertain value.

Notices are appended of such varieties as are, or promise to become desirable for either the home garden or for commercial planting, as well as of certain more recent ones not yet fully tested.

For convenient reference they are alphabetically arranged, as far as practicable, by their recognized common names, and also designated specifically.

#### AMERICAN RED RASPBERRIES—*R. strigosus*.

(Including possible and supposed hybrids with *R. Idceus*.)

Brandywine, Cuthbert, Early King, Hansell, Loudon and Miller rank as more or less desirable commercial varieties.

Church is large, and of high, sprightly flavor, but so inclined to crumble in picking, as to be quite objectionable. The plant also lacks vigor and productiveness.

Gladstone, sent forth, years since, under an honored name, produces a crop of fruit at the usual season, and a second one, in autumn, upon the current season's canes, but both are practically nearly or quite worthless, at least in our northern climate.

Golden Queen is merely a yellow Cuthbert, in plant as well as in fruit. It is the best of the yellow, suckering varieties; though, unfortunately, somewhat lacking in productiveness. It is well worth a place in the home plantation.

Marlboro and Thwack are regarded as hybrids. Both are of rather low quality. They are popular on account of size, and perhaps productiveness and good handling qualities.

Reeder, next to Herstine, is large, excellent, and fairly productive. The best of the red varieties for the home plantation.

Turner, though very hardy, and of excellent quality, is too small and unattractive in appearance. It is nearly or quite superseded.

#### BLACKCAPS.—*R. occidentalis*.

Conrath, Cromwell, Souhegan, Tyler, Doolittle and Palmer are among the earliest of the species. Of these, Palmer has, so far, proved superior in size and productiveness, though others approach it very nearly in these respects.

Earhart is desirable, if at all, for its habit of producing a second crop of fruit, in autumn, upon the current season's canes, which, however, in this climate, is quite liable to be ruined by frost while yet immature.

Eureka, Gregg, Kansas, Nemaha, and several others are valuable as medium to late commercial varieties.

Hilborn is of superior quality; and for this reason, desirable for the home plantation, for those who prefer blackcaps.

Johnston and Ohio are productive and popular for evaporating, yielding, as they do, an unusually large percentage of the dried product, which, however, is mainly due to their excessive seediness.

A very considerable number of the tabulated varieties of this species, though for several years before the public, and of nearly or quite average quality and actual value, seem likely never to win popularity, and may,

perhaps, be dropped from our lists, while others, yet more recent, require a longer trial to determine their true status.

#### EUROPEAN RASPBERRIES—*R. Idæus*.

*Also including possible hybrids.*

Herstine (a possible hybrid between *Idæus* and *strigosus*), although rarely injured by the cold of our lake shore winters, is generally safer with slight protection. The fruit is large, bright red, and of excellent quality—a fruit for the home garden.

Superlative is scarcely yet properly tested here. The fruit is unusually elongate-conical; and of mild favor.

#### INTERMEDIATE AMERICAN RASPBERRIES—*R. Neglectus*.

Muskingum and Shaffer are chiefly valued as superior canning varieties, and several others of this species are similarly useful; while others, yet but partially tested, may be regarded as promising for similar purposes. As a species, their dull color and "smoky" appearance are objectionable.

By many persons it is assumed that this species is the result of accidental hybridization, probably between *R. occidentalis* and *R. strigosus*.

#### JAPANESE MAYBERRY—*R. microphyllus*; Syn., *R. palmatus*.

This was originated by Luthur Burbank, of Santa Rosa, California, as an improved *R. palmatus*, its parentage being *R. palmatus*, pollinated with Cuthbert pollen. *R. palmatus* being a synonym of *R. microphyllus*, that is retained as the leading specific name.

The plant has not yet fruited here; and its hardiness here is doubtful. It will receive protection during the coming winter.

#### JAPANESE WINEBERRY—*R. phœnicolasius*.

This has now been on trial here for several years, and the plants prove entirely hardy in this lake shore climate. The foliage is healthy and the plant vigorous. The bloom also is large, showy and abundant, but the fruit, though bright colored, is practically worthless.

Reports, from diverse sources, indicate that other varieties, of much higher quality, are in cultivation; and it seems probable that a batch of seedlings, of varying quality, have been distributed.

#### LOGAN—*R. ursinus*. X *R. Idæus*.

This is supposed by the originator to be the result of hybridization as above, although, till quite recently, hybridization between species has been very rare.

It has not yet fruited here, and its hardiness is yet somewhat in doubt.

STRAWBERRY-RASPBERRY—*R. rosæfolius*; Syn., *R. sorbifolius*.

This is herbaceous in habit, increasing, as does quack grass and Canada thistle by underground stolons, for which reason it may, perchance, even become a troublesome weed.

Here it grows to the height of two feet or more, and blooms and fruits sparsely till frost. The blossoms are single, but large and showy, and the fruit beautiful, but worthless. It matured specimens here, this season, as late as the middle of October.

For the specific names of the foregoing recent novelties, the writer is indebted to Assistant Pomologist Wm. A. Taylor, of the National Department of Agriculture, and to Professor L. R. Taft, of the Michigan Agricultural College.

BLACKBERRIES—*Rubus villosus*.

The plantation was treated in early spring, while growth was yet dormant, with a strong solution of copper sulphate as a preventive of fungus.

The only insect which has proved troublesome during the past season is the leaf miner, which has been increasingly abundant for several years past. Specimens of this insect and its work, were sent to the Entomological Division of the National Department of Agriculture, and there reported to be, probably, *Lithocolletis ænea*; but with the statement that little is known of its habits, and that no better method of attacking it can be advised, than that we have already pursued—the prompt gathering and burning of the affected foliage, which is unavoidably a slow and expensive process; especially since there is, apparently, a second brood, necessitating a repetition of the process.

The stand of plants is now in its third year since replanting, but owing, at least in part, to repeated and severe drouths, and also to the custom of originators and introducers, of sending an insufficient number of plants for a trial stand, a comparison of varieties, based upon total products is, in many cases, impracticable, for which reason resort is had to comparative estimates.

Severe drouth, during the growing and ripening season, nearly or quite ruined the fruit of many varieties, though a timely rain served to revive such as were not already past help.

In the following table, as well as throughout this report, specific names, as well as objectionable words employed in naming fruits, are italicised; and the latter are dropped in all cases when not necessary to insure identity:

Tabulation of Blackberries, 1897.

No	Names.	Plant.				Fruit.				Remarks.	
		Planted	Bloomed.	First picking.	Last picking.	Product	Form.	Color.	Weight. Ounces.		Quality. Scale (1-10)
1	Agawam	1888	June 11	July 31	Aug. 28	5	ro1	b	1-5	7-8	Not sufficiently productive. Productive, but lacks size. Its value not yet determined. Lacks hardness. A berry for the home garden.
2	Ancient Briton.	1888	" 7	" 31	Sept. 10	10	o	b	1-8	8-9	
3	Childs Tree	1888	" 17	" 29	Aug. 27	7	rov	b	1-8	4-5	
4	Early Harvest	1888	" 14	" 22	" 10	7	o	b	1-15	5-6	
5	Early King.	1880	" 9	" 22	" 10	7	o1	b	1-14	7-8	
6	Early Mammoth.	1888	" 7	" 30	" 27	10	o1	b	1-9	6-7	An early market berry. Variably productive. Large, showy, plant very thorny. Only partially tested. Old, flavor superior.
7	El Dorado.	1894	" 12	" 28	" 8	8	oov	b	1-13	6-7	
8	Erie.	1888	" 15	Aug. 2	Sept. 8	9	o	b	1-7	4-5	
9	Fruitland.	1883	" 14	July 31	" 8	10	ro	b	1-8	4-5	
10	Kittatunny.	1888	" 14	July 31	" 8	10	o1	b	1-9	7-8	
11	Knox	1888	" 12	" 27	" 8	10	o	b	1-6	6-7	Large, hardy; lacks productiveness. Still valued for market. Requires further trial. But partially tested. Promising.
12	Lawton	1888	" 14	" 31	" 8	10	o	b	1-6	6-7	
13	Lincoln	1883	" 9	Aug. 4	" 13	10	rov	b	1-10	8-9	
14	Lovett Best.	1896	" 15	" 2	" 12	4	r	b	1-13	5-6	
15	Maxwell	1894	" 11	July 29	" 16	8	ro	b	1-9	5-6	
16	Minnewaska.	1888	" 12	Aug. 2	" 13	10	ro	b	1-7	5-6	A market variety. Rather variable. From Ohio; try further. Not yet in fruit. A curiosity; cut leaved.
17	Nevada	1888	" 14	July 31	" 16	10	o	b	1-6	5-6	
18	Ohmer	1893	" 9	" 30	" 10	10	rov	b	1-6	6-7	
19	Otis	1897	" 23	Aug. 16	" 10	7	o	b	1-12	5-6	
20	Oregon Everbearing	1893	" 23	Aug. 16	" 10	7	o	b	1-12	5-6	
21	Piassa.	1895	" 12	July 31	Aug. 17	6	o1	b	1 16	5-6	Its first fruiting. New, promising. Not fully tested. Rather small, very hardy. Good, hardy; valuable.
22	Reyer	1896	" 8	Aug. 2	" 31	5	oov	b	1-9	5-6	
23	Sanford	1894	" 8	" 4	" 23	7	rov	b	1-13	4-5	
24	Snyder	1888	" 9	July 31	" 25	10	o1	b	1-9	9-10	
25	Taylor	1888	" 9	" 31	Sept 10	10	ro	b	1-8	9-10	
26	Thompson	1888	" 11	" 29	Aug. 23	7	o1	b	1-7	3-4	Value doubtful. Hardy, productive; too small. Large, good, hardy. Large, low quality; tender. Large, low quality; tender.
27	Triumph Western	1888	" 10	Aug. 2	" 25	10	ro	b	1-12	4-5	
28	Wallace	1888	" 12	July 30	" 27	10	o	b	1-8	6-7	
29	Wilson	1888	" 10	" 30	" 23	10	o1	b	1-8	3-4	
30	Wilson, Jr.	1888	" 10	" 30	" 27	10	o1	b	1-10	3-4	

DEWBERRIES—R—Canadiana.

1	Austin	1896	-----	-----	-----	-----	-----	-----	-----	From Texas; not yet fruited.
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DEWBERRIES - R - *Canadensis*.

No	Names.	Plant.				Fruit.				Remarks.
		Planted	Bloomed	First picking.	Last picking.	Product	Form.	Color.	Weight. Ounces.	
1	Austin	1896								From Texas; not yet fruited.

Abbreviations: i, irregular; o, oblong; ov, ovate; r, roundish; b, black.

Agawam, Knox and Wallace are fairly hardy, large, and of good quality; but scarcely productive enough to be popular for market planting.

Ancient Briton and Triumph *Western*, are vigorous, very hardy and productive, but quite too small for market unless under high culture, severe pruning and liberal fertilizing.

Childs *Tree* has done unusually well the past season, but so far does not seem entitled to the name "*tree*," and must continue to improve to win popularity.

Early Harvest is tender, and needs winter protection, even at the lake shore.

Early Mammoth, though possessing good qualities for the market, has so far, failed to win popularity.

Early King, El Dorado, Erie, Lincoln, Minnewaska, Nevada and Thompson, occupy a sort of middle ground between success and failure.

Fruitland, Lovett, Maxwell and Ohmer are not yet fairly past the probationary stage.

Kittatinny, Lawton, Snyder, Taylor, Wilson and Wilson Jr. have long been popular with planters, and seem likely to maintain such position for an indefinite period.

Otis, Piassa, Reyner and Sanford are yet too recent to have given reliable indications of their true character.

Oregon *Everbearing* is a cut leaved variety from the Pacific coast. It has no value here, save perhaps as a curiosity.

Of those mentioned, Kittatinny, Snyder and Taylor rank highest in quality, and are specially desirable for the home plantation, while they are also among the more profitable market varieties.

Of Dewberries, the Austin is highly praised in the place of its origin, at the south, but it can scarcely be expected to excel or even equal the Lucretia, which was introduced and found successful many years since. Indeed it can scarcely be expected that this fruit can ever become popular, save perhaps as a means of opening the blackberry season a few days earlier.

#### SERVICE BERRY—*Amelanchier*.

#### SYNONYMS—JUNE BERRY, SHAD BUSH.

The varieties so far tested here are dwarfs, making growths not more than four or five feet in height.

Common is so designated since it was originally received without name.

Success is the variety introduced, several years since, under this name. It differs very slightly, if at all, from the foregoing.

Mammoth, received more recently, from Indiana, was, at the first, apparently, somewhat more vigorous than the others; but, more recently, these varieties differ very little, if at all, in this or any other respect.

A plant, received this season, from the Department of Agriculture, at Washington, as a supposed distinct variety, has not yet grown sufficiently to develop any distinguishing peculiarities.

Birds are especially fond of this fruit, which, in appearance, is very similar to that of the native huckleberry, although by no means equaling it in quality. If planted in sufficient quantity, it might become the means of diverting the attacks of birds from other and more important fruits of the same season.

CURRANTS.—*Ribes*.

The stand of currants, having been transplanted two years since, is not yet at its best, so far as the yield of fruit is concerned, while it is also true, that several of the newer varieties have not yet a full stand of plants.

On March 29th, foliage being yet dormant, the plants were sprayed with a solution of one pound of copper sulphate, in twenty-five gallons of water.

The spray of potassium sulphide, used to prevent mildew of gooseberries, proves effective also in preventing loss of the foliage of currants, for which reason a spray of this has been occasionally applied to the currants also.

On May 29th, aphides having appeared on the foliage of currants they were treated with a decoction of tobacco stems in water, the same being directed upon the under side of the leaves where only these insects occur.

The imported currant borer—*Egeria tipuliformis*, which has, for several years, proved a very troublesome enemy of the currant throughout this region, has been persistently attacked by cutting away and burning the infested twigs. This has already so reduced their numbers that a careful examination, in early November of the present year, only detected a single larva.

□ The currant worm—*Nematus ventricosus*, appeared at the usual season but yielded readily to the usual treatment with a spray of buhach in water. This is considered preferable to the usual poisonous applications, since it must be applied when the fruit is near ripening.

TABULATION OF CURRANTS.—*Ribes rubrum* and *nigrum*.

Names.	Origin.	Planted.	Bloomed.	Ripe.	Productiveness.— Scale 1 to 10.	Form.—r, round- ish.	Color.—b, black; r, red; w, white.	Quality.—Scale 1 to 10.	Weight of cluster in ounces.	Use d, dessert; k, kitchen; m, mar- ket.
Champion .....	England .....	1889	May 10	July 17	8	r	b	5-6	1-6	m k
Cherry .....	Europe .....	1888	" 4	" 7	10	r	r	5-6	1/2	m
Engish .....	England .....	1892	" 10	" 14	10	r	b	5-6	1/2	m k
Fay .....	New York .....	1888	" 5	" 10	10	r	r	6-7	1/2	m k
Holland .....	Europe .....	1889	" 10	" 25	-----	r	r	5	-----	m k
Lakewood .....	Ohio .....	1890	" 6	" 10	10	r	r	6-7	1/2	m k
Lee .....	America? .....	1888	" 10	" 17	10	r	b	3-4	1/2	m k
London .....	England .....	1890	" 4	" 10	10	r	b	4 5	1/2	m k
Naples .....	Europe .....	1888	" 4	" 10	10	r	r	5-6	1/2	m k
North Star .....	Minnesota? .....	1890	" 4	" 19	10	r	r	6-7	1/2	m k
Red Dutch .....	Europe .....	1888	" 4	" 19	10	r	r	7-8	1/2	d k
Ruby Castle .....	Europe? .....	1892	" 4	" 15	7	r	r	6-7	1-5	d k
Ruby Moore .....	New York .....	1890	" 4	" 17	10	r	r	7-8	1/2	d k
Saunders .....	Ontario .....	1890	" 10	" 14	10	r	b	3-4	1-7	m k
Select Moore .....	Massachusetts? .....	1890	" 4	" 10	10	r	r	5-6	1/2	m k
Versaillaise .....	France .....	1888	" 5	" 10	10	r	r	6-7	1/2	m k
Victoria .....	England .....	1888	" 8	" 10	10	r	r	5-6	1/2	m k
Wales Prince .....	Ontario? .....	1890	" 10	" 10	10	r	b	5-6	1-6	m k
White Dutch .....	Europe .....	1888	" 5	" 10	10	r	w	10	1/2	d k
White Gondoin .....	Europe .....	1890	" 5	" 10	9	r	w	9	1/2	d k
White Grape .....	Europe .....	1888	" 4	" 10	10	r	w	7-8	1/2	d k m
Wilder .....	New York .....	1890	" 4	" 10	10	r	r	6-7	1/2	m k



Botanically, the red and the white currants are both included in the species—*rubrum*; and the black, fetid varieties belong to the species—*nigrum*. Since, therefore, the color of the fruit unmistakably indicates the species, the botanical column is omitted from the tabulation.

The black currants, *R. nigrum*, are all very much alike in quality as well as in productiveness as grown here; but Naples stands easily at the head of the list, so far as vigor of the plant is concerned.

Crandall, *R. aureum*, has been dropped as valueless, for any practical purpose, and was not included in the recent replanting of currants.

Cherry and Fay, though by no means superior if even equal to others in quality, or even in productiveness, are large, and for this reason only are popular with commercial planters.

Holland possesses great vigor of plant, as well as persistency of foliage, while it compensates for its rather small berry in length of cluster, together with productiveness. It is a popular market variety at the west.

Lakewood and Wilder have the characteristic foliage, as well as the large fruit of Cherry and Fay, though in most seasons they have not equalled them in productiveness.

London Red, sometimes called *London Market*, is very vigorous and productive, and for these reasons somewhat popular as a market variety, though neither very large nor of high quality.

North Star is of recent origin and the plant very vigorous, though, so far, it has not proved superior in other respects.

Red Dutch, though among the very oldest varieties, is scarcely equalled, all things considered, by any modern ones. Under proper, liberal treatment, it very nearly equals Cherry in size, and is superior to it in flavor.

Ruby Castle and Ruby Moore are amateur varieties; the latter, especially, being superior in quality.

Select Moore is, in fruit, much like Cherry, but quite superior to that variety in quality.

Versaillaise, though somewhat distinct in habit of growth, is so much like Cherry that, formerly, many persons considered them identical.

Victoria holds its foliage later than most other varieties and the shoots are seldom attacked by the twig borer *Aegeria tipuliformis*, for which reason, mainly, it is extensively planted for the market.

White Dutch and White Gondoin are much alike, as grown here. They have yet no superior, so far as beauty and mild, rich flavor are concerned, though slightly inferior to certain others in productiveness.

White Grape has a more spreading habit of growth, with slightly larger fruit, and is somewhat more productive, though scarcely equal to the foregoing in quality. It is occasionally planted for commercial purposes.

#### GOOSEBERRIES—*Ribes*.

Gooseberries, while yet dormant, were sprayed on March 29th with a solution of one pound of copper sulphate in twenty-five gallons of water, as a preventive of mildew.

On May 4th the plat was treated with a spray of three ounces of potassium sulphide, (liver of sulphur) in ten gallons of water. This treatment was repeated weekly, weather permitting, until the fruit was ripe and gathered.

On June 10th owing apparently to unfavorable climatic conditions or possibly, to imperfect spraying, mildew appeared upon the fruit of some of the European varieties. The infected fruit was at once gathered and burned.

The crumpling of the foliage, due apparently to the presence of aphides, has been very rare this year. It usually appears only at the tips of the young twigs, which are cut away and burned, when discovered.

The currant worm, *Nematus ventricosus*, which attacks the foliage of the gooseberry, in common with that of the currant, was also sprayed with a decoction of buhach in water with similarly satisfactory result.

Several varieties, although tabulated, have, for one cause or another, failed to fruit satisfactorily, for which reason, unavoidably, several particulars are not given in the table.

TABULATION OF GOOSEBERRIES, 1897.

Names.	Species.	Planted.	Bloomed.	Ripe.	Weight of berry in ounces.	Productiveness.— Scale 1 to 10.	Quality.—Scale 1 to 10.
Apex.....	Grossularia ?	1893	May 5	July 25	$\frac{3}{4}$	10	7-8
Auburn.....	"	1890	" 10	" 21	$\frac{3}{4}$	10	8-9
Bendelon.....	"	1894	" 10	" 19	1-5	10	5-7
Champion.....	"	1891	" 10	" 19	1-17	10	5-6
Chautauqua.....	"	1892	" 6	" 19	$\frac{3}{4}$	10	7-8
Columbus.....	"	1895	" 5	" 24	---	---	6-7
Downing.....	Oxyacanthoides.	1888	" 6	" 21	1-7	10	6-7
Golden Prolific.....	Grossularia	1891	" 12	"	---	---	---
Houghton.....	Oxyacanthoides.	1888	" 5	July 14	1-16	7	10
Industry.....	Grossularia	1889	" 12	"	---	---	---
Keepsake.....	"	1894	" 10	July 19	$\frac{3}{4}$	7	8-9
Lancashire.....	"	1894	" 6	" 19	$\frac{3}{4}$	10	5-6
Orange.....	"	1890	" 5	" 13	1-10	9	8-9
Pale Red.....	Oxyacanthoides.	1890	" 5	" 12	1-22	10	9-10
Pearl.....	"	1890	" 5	" 19	1-6	9	7-10
Red Jacket.....	" ?	1890	" 12	" 21	1-6	7	7-8
Smith.....	"	1898	" 5	" 14	$\frac{3}{4}$	7	9-10
Strabler.....	Cynobati.	1892	" 5	" 19	1-6	10	7-8
Tree.....	"	1892	" 18	" 26	1-12	8	5-6
Triumph.....	Grossularia	1890	" 10	" 21	$\frac{3}{4}$	4	6-7

Apex, a recent seedling from Oregon, has this season, for the first time, produced a fair crop of fruit. It has been understood to be a seedling of the indigenous variety of that region but the habit of growth, and also the size and general character of the fruit, correspond so perfectly with *R. grossularia*, as to warrant the suspicion that it may be an Oregon seedling of that species.

Auburn, Bendelon, Champion, Chautauqua, Columbus, Golden Prolific, Keepsake, Orange, Pearl, Red Jacket and Triumph are understood to be either American seedlings of the European species or possibly hybrids between native and foreign varieties.

Downing and Smith seem to have been very generally accepted as native seedlings, and yet there is more or less ground for suspicion of possible hybridization between the native and the foreign species.

Houghton and Pale Red are among the oldest of the native cultivated varieties, and, so far, are scarcely excelled in either productiveness or quality. Small size is their chief fault.

Strubler and Tree are obviously pure natives. The plants are vigorous and healthy, and the fruit, especially of the former, is of high quality. They are of rather small size, and, so far, only moderately productive.

#### CHERRIES—*Prunus*.

At the date of blooming there was promise of a bountiful crop of this fruit, but, subsequently, the season proved so specially unfavorable that a very large percentage of the bloom proved abortive.

Putnam scale having been discovered on a few trees, they were sprayed March 31st with kerosene emulsion, consisting of five gallons of kerosene and six pounds of whale oil soap, in forty gallons of water.

Prior to April 15th, growth remaining dormant, the remainder of the cherries were sprayed with a solution of copper sulphate, consisting of one pound of the sulphate in twenty-five gallons of water.

On July 2d and again on the 6th sprayed several cherry trees on which the slug, *Eriocampa cerasi*, had appeared, with kerosene emulsion on the former, and tobacco decoction on the latter date. Both proved effective.

Aphides have proved unusually persistent this season. They appeared on the foliage of a few cherry trees late in September, and were subdued by the use of tobacco water.

In the foregoing tabulation, as well as throughout this report, the numerical estimates upon the scale 1 to 10 are arrived at by comparing varieties of the same *species* only; as, for instance, comparing morellos with morellos, dukes with dukes, and sweet cherries with sweet cherries, ten being the maximum.

These deductions, being based upon the crop of the past unusually unfavorable season, can scarcely be accepted as a trustworthy indication of the comparative value of varieties during other seasons.

TABULATION OF CHERRIES, 1897.

Names.	Species.	Planted.	Bloomed.	Ripe.	Weight of a specimen in ounces.	Productiveness.—Scale 1 to 10.	Quality.—Scale 1 to 10.
Abbesee.....	Morello.....	1888	May 8	July 21	1-7	2	5-6
Angouleme.....	".....	1888	" 8	" 26	1-6	2	6-7
Badaccoonyi.....	Avium.....	1894	" 8				
Baendor.....	Morello.....	1892	" 8				
Baltavari.....	Avium.....	1894	" 8				
Bessarabian.....	Morello.....	1888	" 8	Aug. 2			
Brusseler Braune.....	".....	1888	" 10	" 2			
Carnation.....	Duke.....	1891	" 8	July 9	1-6	9	7-8
Centennial.....	Avium.....	1893	" 7				
Choisy.....	Duke.....	1888	" 8		1-6		9-10
Cleveland.....	Avium.....	1888	" 7	June 30	1-5	5	7-8
Coe.....	".....	1888	" 8	" 26	1-5	4	4-5
Downer.....	".....	1888	" 8	July 15	1-7	3	5-6
Dwarf Rocky Mountain.....	Besseyi.....	1894	" 20				
Dyehouse.....	Morello.....	1891	" 8	June 30	1-8	6	5-6
Eagle Black.....	Avium.....	1888	" 8	July 12	1-7	2	5-6
Early Purple.....	".....	1892	" 6	June 25	1-6	5	4-5
Elton.....	".....	1892	" 8	" 30	1-5	2	4-5
Espere.....	Morello.....	1892	" 8				
Eugenie.....	Duke.....	1888	" 7	June 30	1-6	1	8-9
Everbearing.....	".....	1892	" 8	" 12	1-6	7	8-9
Florence.....	Avium.....	1892	" 8				
Fransdorfer Weichsel.....	Morello.....	1888	" 8	June 21	1/4	1	6-7
Galopin.....	".....	1891	" 8				
George Glass.....	".....	1888	" 10			1	
German Kraus.....	Avium.....	1894	" 13				
Griotte du Nord.....	Morello.....	1888	" 8	Aug. 2		1	
Hortense.....	Duke.....	1888	" 8	July 8	1-5	5	7-8
Ida.....	Avium.....	1893	" 8				
King Amarelle.....	Morello.....	1891	" 8	July 19	1-8	1	4-5
Knight Early.....	Avium.....	1891	" 7			1	
La Maurie.....	Avium.....	1893	" 8				
Lancaster.....	Duke.....	1894	" 13				
Late Duke.....	Duke.....	1890	" 8	July 15	1/4	1	7-8
Lithauer Weichsel.....	Morello.....	1892	" 8	" 22	1-9	6	4-5
Lutovka.....	".....	1888	" 8			1	
Magnifique.....	Duke.....	1888	" 13	July 28	1-6	5	8-9
Mahaleb.....	Mahaleb.....	1893	" 8				
Mary Kirtland.....	Avium.....	1891	" 8	June 30	1-6	7	6-7
Mastodon Black.....	".....	1893	" 8				
May Duke.....	Duke.....	1888	" 8	June 30	1-7	6	8-9
Mezel.....	Avium.....	1891	" 7	" 30	1-7	2	4-5
Minnesota Ostheim.....	Morello.....	1892	" 8	July 9	1-8	1	6-7
Modnyansky.....	Avium.....	1894	" 8				
Montmorency.....	Morello.....	1888	" 10	June 30	1-7	5	4-5
Montmorency Ordinaire.....	".....	1891	" 8	July 22	1-5	9	5-6
Montrouil.....	Duke.....	1890	" 8	" 12	1-5	3	8-9
Napoleon.....	Avium.....	1892	" 7	" 17	1-7	8	3-4
Northwest.....	Morello.....	1893	" 12	" 19	1-7	10	5-6
Ohio Beauty.....	Avium.....	1891	" 8	June 30	1-6	7	6-7
Olivet.....	Duke.....	1890	" 8	July 12	1-5	1	7-8
Orel 25.....	Morello.....	1893	" 10				
Orel 27.....	".....	1893	" 10				
Ostheim.....	".....	1891	" 8	July 21		1	3-4
Ostheimer.....	".....	1893	" 8	" 22	1-6	9	4-5
Philippe Louis.....	".....	1888	" 8	" 8	1-8	1	7-8
Plymouth Rock.....	Avium.....	1896					
Purity.....	".....	1893	" 10				
Richmond.....	Morello.....	1893	" 8	July 12	1-8	5	4-5
Rockport.....	Avium.....	1891	" 7	June 30	1-5	8	6-7

TABULATION OF CHERRIES, 1897.—*Concluded.*

Names.	Species.	Planted.	Bloomed.	Ripe.	Weight of a specimen in ounces.	Productiveness.—Scale 1 to 10.	Quality.—Scale 1 to 10.
Royal Duke.....	Duke.....	1891	" 8	June 30	1 8	10	5-6
Rupp.....	".....	1894	" 8	"	"	"	"
Schmidt.....	Avium.....	1894	" 8	"	"	"	"
Sebril.....	".....	1896	" 12	"	"	"	"
Sklanka.....	Morello.....	1888	" 10	July 12	1-7	3	4-5
Spanish Yellow.....	Avium.....	1891	" 8	" 14	1-5	3	10
Spate Amarelle.....	Morello.....	1884	" 15	" 26	1-6	2	6-7
Strauss Weichsel.....	".....	1888	" 8	" 1-6	1-6	1	5-6
Suda.....	".....	1893	" 10	" 22	1-6	8	7-8
Tartarian Black.....	Avium.....	1888	" 8	" 8	1-5	2	6-7
Ulatia, Cal. Advance.....	".....	1893	" 6	"	"	"	"
Weir 2.....	Morello.....	1893	" 12	July 12	1-8	5	4-5
White Bigarreau.....	Avium.....	1896	"	"	"	"	"
Windsor.....	".....	1891	" 8	July 14	1-5	7	4-5
Wood Governor.....	".....	1891	" 8	June 30	1-5	2	5-6
Wragg.....	Morello.....	1892	" 11	July 22	1-6	7	5-6

## MORELLOS.

Abbesse, Angouleme, Bessarabian, Brusseler Braune, Frauendorfer Weichsel, George Glass, Griotte du Nord, Lithauer Weichsel, Lutovka, Orel 25, Orel 27, Ostheim, Ostheimer, Sklanka, Spate Amarelle and Strauss Weichsel are all understood to be importations from northern and eastern Europe, with the hope that more or less of them may prove adapted to the trying climate of our northwestern states. Of these several are vigorous, healthy and very late, strictly culinary fruits; but with one or two exceptions, so far, they are comparatively unproductive, and not relatively promising where the better known varieties succeed.

Baendor, Esperen, Galopin, King Amarelle, Minnesota Ostheim, Northwest, Suda, Weir 2 and Wragg came to us without a history, excepting only the last two, which are known or supposed to be of western origin. So far Weir 2, and possibly Suda, are apparently the most promising of these.

Of the Morellos, Dyehouse, though of very low, spreading habit of growth, with rather small, light-colored fruit, is among the first to ripen and is productive and profitable.

There are ostensibly three Montmorencys in cultivation, but there is so much confusion of names that identity is, so far, quite uncertain. The first of these came as simple Montmorency, and quite possibly may prove to be Large Montmorency. That received as Large Montmorency turns out to be Dyehouse. Trees received as Montmorency Ordinaire have now fruited several seasons, but we have not, so far, been able to assuredly determine their correctness.

Philippe Louis is large and excellent for culinary purposes, and the tree healthy and vigorous, but, unfortunately, persistently unproductive.

Richmond Early has, so far, been the leading cherry for market planting, but recently there are indications that it may find a rival in some one of the Montmorencys.

## DUKES.

Carnation, Late Duke, Magnifique, Olivet and Royal Duke, although vigorous, and of generally fair quality, must take second or third rank, so far as productiveness is concerned.

Choisy *Belle de*, is slightly lacking in productiveness, but is second to no other cherry in beautiful appearance and fine flavor.

Eugenie is promising, but requires further trial.

Everbearing, as the name indicates, ripens its fruit in succession during a somewhat lengthened season, and, for this reason, may prove desirable for home use.

Hortense, is one of the largest of the species, and, where hardy, is a desirable market variety.

May Duke is the type, as well as the leading variety of the species; and, where sufficiently hardy, is among the most valuable, as well as profitable for market.

Montrueil is a comparatively recent French variety. It is an early and profuse bearer and, in both tree and fruit, promises well as a commercial variety.

Lancaster and Rupp are perhaps of this species, though too recently planted to satisfactorily indicate their specific status.

## HEARTS AND BIGARREAUS.

Badacconyi, Baltavari and Modnyansky are obviously of this species. They were recently imported, in cion, from southeastern Europe, by the national Department of Agriculture. So far, they are vigorous and healthy here, but have not yet matured fruit.

Centennial, Florence, German *Kraus*, La Maurie, Mastodon *Black*, Plymouth *Rock*, Purity, Schmidt, Ulati (*California Advance*), and White *Bigarreau* are clearly of this species, although none of them have yet fruited sufficiently to warrant a description.

Cleveland, Mary *Kirtland*, Ohio *Beauty*, Rockport and Wood *Governor*, were sent out, years since, by the late Prof. Kirtland of Cleveland, Ohio. Under judicious treatment, in common with this species, they are hardy in southern Michigan.

Coe *Transparent*, is one of the most beautiful and excellent of the species, and worthy of a place in the home plantation.

Downer, and also Eagle *Black*, are unusually hardy, rather late, very productive, and valuable for either the home or market.

Early Purple is specially desirable as the earliest cherry, occasionally ripening with the earliest strawberries.

Elton, Knight *Early*, Mezel, Napoleon, Spanish *Yellow* and Tartarian *Black* are old and generally known varieties, and with two or three exceptions prized as commercial varieties.

Windsor is a quite recent introduction, ripening rather late, and promising well, even as a commercial variety.

Ida, although not yet in bearing, is believed to be of this species.

## DWARF ROCKY MOUNTAIN OR SAND CHERRY.

Dwarf Rocky Mountain, *Prunus Besseyi*, has shown fruit here for the past two years. It has even been commended through the public press as

well as in nursery catalogues, as of fine flavor. If, however, the plants tested here fairly represent the variety thus praised, the least that can be said of it is, that it is one of the most arrant swindles ever imposed upon the public. The difference between *P. Besseyi* and *P. Pumila* being slight, we may have received the latter by mistake or otherwise.

#### PRUNUS MAHALEB.

Mahaleb, *European Bird cherry*, is used extensively as a stock on which improved varieties are worked. It has fruited here for two years past. The European name would seem to be appropriate for this country also, since, although it fruited abundantly the past season, we were not able to get even a taste of ripe fruit, but all were taken by birds while yet immature.

#### PEACHES—*Prunus* or *Amygdalus*.

Doubtless as a result of continuous reproduction and cultivation in different soils and climates, the peach has sported into strains or races, each more especially successful in its accustomed climate or soil.

Of these the Peen-to race is mainly confined to the extreme south, and is followed, as we pass northward, by the Honey race, the Spanish, the Persian, the Oriental Blood, and the North Chinese races.

Among these the Persian race is mainly popular from central Georgia and Texas northward, with, quite recently, an occasional North Chinese variety on trial.

While at the extreme south, these distinctions become important in a choice of varieties to be planted, these races have now become so intermixed or hybridized by cross-fertilization that many such cross-bred varieties are found successful and more or less popular even at the north.

Since, therefore, the question of *race* must depend upon a knowledge of the history of each variety, rather than upon any distinctive peculiarity of either tree or fruit, it seems better that all attempt at such classification be omitted.

The past season, throughout, has been later than usual, and, as heretofore, the pruning has been done while growth was yet dormant, the pruning of peaches having been completed on April 20th.

Completed the early spraying of peaches on April 15th, using one pound of copper sulphate in twenty-five gallons of water. Such spray has, in previous seasons, proved an effectual preventive of leaf curl, *Taphrina deformans*; but, for some unexplained reason, due probably to unusual weather conditions, it failed of the usual effect, the "curl" being very prevalent, alike upon sprayed trees and those not sprayed.

May 17th examined peach trees for borers, the larvæ of *Ægeria exitiosa*, finding a few only.

May 19th to 21st, applied a coating of whitewash to the trunks and large branches of peach trees, as a means of preventing a deposit of the eggs of the pin-borer which, during the last two or three years, has proved to be a serious and even fatal enemy of the peach tree in this vicinity. Such application is so far merely experimental, since there are no precedents as guides to the treatment of this insect. The mixture used was milk of lime with a little crude carbolic acid; the whole thickened with hard soap to

give it body and tenacity. Experience so far indicates that the application will prove at least partially successful.

May 29th, some of the early varieties of peaches were jarred for curculio, but few were caught, and after a few trials the process was mainly confined to the plums, upon which the attacks were much more persistent.

The Rose Chafer, *Macrodactylus subspinosus*, which in past years has been abundant, has, during the past season, been represented by a very few specimens only, which have been caught in jarring for curculios.

We repeat the suggestion of last year that, as a safeguard against error, a new or unknown variety when sent for trial or identification, should invariably be accompanied by a careful description of both tree (or plant), and fruit, and that the intended name should accompany it, to the exclusion of numbers or of names with numbers attached, the subsequent changing of which is found to be a fruitful source of error, and of the multiplication of vexatious synonyms. Such names, moreover, should be in accordance with the Rules of American Pomology, and with the practice of the National Division of Pomology.



TABULATION OF PEACHES, 1897.

Names.	Planted.	Bloomed.	Flowers—l, large; s, small.	Glands—g, globose; r, reniform; s, serrate.	Ripe.	Adhesion—c, cling; f, free; s, semi- cling.	Weight of speci- men in ounces.	Productiveness— Scale 1 to 10.	Quality—Scale 1 to 10.
Adrian.....	1892	May 6	s	g	Oct. 1	f	5	1	6-7
Advance.....	1897								
Alberge.....	1893	May 6	s	r		f			
Albright.....	1890	" 6	s	g	Oct. 4	f	5	1	5-6
Alexander.....	1892	" 6	l	g	Aug. 19	s	6	1	5-6
Allen.....	1890	" 6	s	r	Oct. 7	f	5	5-6	5
Alpha.....	1890	" 7	s	r	Sept. 27	f			
Amelia.....	1890	" 7	s	g	" 9	f	4		6-7
Amesen.....	1890	" 7	l	g	July 31	f	5	2	5-6
Andrews.....	1890	" 7	s	r		f			
Arctic.....	1894	" 5	l	r	Oct. 4	f	4	1	3-4
Barber.....	1893	" 6	s	r	Sept. 23	f	6	3	6-7
Beers Smock.....	1890	" 7	s	g	Oct. 8	f	4	1	5-6
Bell Favorite.....	1890	" 6	s	g	Sept. 20	f	4	1	4-5
Bequett Free.....	1890	" 6	s	r	" 23	f	7	1	5-6
Berenice.....	1894	" 6	l	r	Sept. 24	f	4	1	4
Bickell.....	1890	" 6	s	r	Oct. 15	f	4	5	4-5
Bishop.....	1890	" 6	l	r	Aug. 26	f	3	2	3-4
Blood Leaf.....	1892	Apr. 30	l	g	Oct. 20	c	4	3	2-3
Bokara.....	1896								
Bonanza.....	1890	May 6	s	r	Oct. 15	f	4	1	1-3
Boyle.....	1890	" 6	s	g	Sept. 17	f	5	2	3-4
Brandywine.....	1896	" 7	s	g	Oct. 8	f	6	1	5-6
Brett.....	1890	" 7	s	r	" 31	c	4	1	2-3
Brigdon, Garfield.....	1890	" 6	s	g	Sept. 13	f	5	1	7-8
Briggs.....	1890	" 6	s	g	" 13	f	5	1	3-4
Bronson.....	1894	" 6	s	r	" 24	f	4	2	6-7
Brown.....	1894	" 5	l	r	Aug. 27	f	3	5	5-6
Burke.....	1892	" 6	l	r	Sept. 4	s	6		5
California.....	1895	" 7	s	r					
Canada.....	1892	" 6	l	g	July 31	s	5	1	4-5
Capital.....	1896								
Chairs.....	1890	May 6	s	r	Oct. 13	f	5	1	3-4
Champion.....	1894	" 6	s	g	Sept. 8	f	6	2	10
Champion (serrate).....	1890	" 6	l	s	Aug. 7	s	5	1	5-6
Chili 2.....	1888	" 7	s	r	Sept. 23	f	6	1	6-7
Chili 3.....	1888	" 6	s	r	" 24	f	5	1	8
Chinese Cling.....	1890	" 7	l	r		c			
Chinese 11741.....	1896								
Cleffey Allen.....	1892	May 6	s	r	Sept. 24	f	5	4-5	5
Clifton Cling.....	1894	" 6	s	r		c			
Columbia.....	1890	" 7	l	r	Oct. 8	f	4	1	2-3
Conkling.....	1890	" 6				f		1	
Connecticut.....	1896	" 7	s	g	Aug. 20	f		1	
Connett.....	1894	" 5	l	r	" 28	f	5	1	7-8
Coolidge Mammoth.....	1892	" 6	s	g	Sept. 20	f	6	3	7
Corner.....	1890	" 7	s	r	" 23	f	5	3	6
Crane.....	1890	" 7	s	r		f			
Crosby.....	1892	" 6	s	r	Sept. 25	f	4	5	7
Crothers.....	1890	" 6	s	g	Oct. 4	f	5	1	6-7
Dennis.....	1890	" 4	l	g	Sept. 17	f	4	1	5-6
Diamond.....	1892	" 6	s	g	Oct. 4	f	5	1	5-6
Druid Hill.....	1890	" 7	s	g	" 8	f	4	1	3-4
Dumont.....	1894	" 7	s	r	Sept. 23	f	4	1	3-4
Dunlap.....	1892	" 7	s	g	" 9	f	5	2	7-8
Dwarf Cuba.....	1892	" 6	s	r					
Early Bernard.....	1888	" 7	s	r	Sept. 7	f	6	1	5
Early Crawford.....	1888	" 7	s	g	" 8	f	6	1	9-10
Early Crawford 1.....	1888	" 7	s	g	" 6	f	5	1	7-8
Early Crawford 3.....	1888	" 7	s	g	" 6	f	3	1	7

## TABULATION OF PEACHES, 1897.—Continued.

Names.	Planted.	Bloomed.	Flowers—l, large; s, small.	Glands—s, globose; r, reniform; s, serrate.	Ripe.	Adhesion—c, cling- ing; f, free; s, semi- cling.	Weight of speci- men in ounces.	Productiveness— Scale 1 to 10.	Quality— Scale 1 to 10.
Early Michigan 15.....	1894	May 6	l	g	Sept. 2	f	4	1	9-10
Early Michigan 16.....	1894	May 4	l	r	Aug. 20	f	5	1	9-10
Early Red.....	1897								
Ede.....	1890	May 6	s	g		f			
Elberta.....	1890	May 6	s	g	Sept. 23	f		1	
Eldred Cling.....	1890	" 6	s	g	Sept. 20	c	5	1	4
Ellison.....	1889	" 7	s	r	Oct. 7	f	4	3	5-6
Engle Mammoth.....	1892	" 6	s	g	Sept. 13	f	5	2	9-10
Ford New.....	1894	" 6	s	g	" 11	f	4	1	6
Ford Red.....	1894	" 3	s	g	" 13	f	4	1	5-6
Ford 1.....	1894	" 3	l	r	" 27	f	4	1	6-7
Ford 2.....	1894	" 6	s	g	Oct. 4	f	4	1	6-7
Ford 3.....	1894	" 8	s	r	" 30	f	4	1	4
Foster.....	1894	" 7	s	g	Sept. 2	f	6	1	7-8
Fox.....	1890	" 7	s	g	Oct. 13	f	3	1	4-5
Geary Hold On.....	1890	" 6	s	r	" 5	f	6	1	5
Gem Cling.....	1890	" 6	s	r		c			
Globe.....	1888	" 10	s	g	Sept. 24	f	6	1	6
Gold Drop.....	1890	Apr. 29	l	r	" 30	f	4	2	7-8
Grant General.....	1890	May 6	s	r	" 7	c	5	1	6-7
Great Western.....	1892	" 6	s	r	Oct. 15	c	4	1	4
Greensboro.....	1896	" 6	l	g					
Gudgeon.....	1890	" 6	s	r	Oct. 15	f	5	1	5-6
Haas.....	1890	" 6	l	r	Aug. 18	f	5	1	5-6
Hale.....	1888	" 8	l	g	" 25	s	6	1	5
Hale Oblong.....	1888	" 7	l	g	" 9	s	5	4	6-7
Hance Golden.....	1890	" 7	s	g	Sept. 13	f	5	1	8-9
Hance Smock.....	1890	" 6	s	r	Oct. 8	f	5	1	5
Heath Cling.....	1890	" 7	s	r		c			
H. No. 34.....	1890					f			
Hinman?.....	1892	" 6	l	r	Sept. 27	f	6	3	7
Hughes IXL.....	1892	" 6	l	r	Nov.	c	2	1	1-2
Husted 101.....	1895	" 6	s	r	Sept. 20	f	3	1	3-4
Husted 130.....	1895	" 6	s	r	" 18	f	3	1	6-7
Husted 700.....	1895	" 6	l	g	Aug. 18	f	4	1	7-8
Hyatt.....	1888	" 7	l	g	" 16	s	5	1	5-6
Hynes.....	1890	" 7	l	g	" 18	s	5	1	5
Hyslop.....	1892	" 6	s	r	Oct. 7	c	4	1	4
Ice Mountain.....	1894	" 6	l	r	Nov.	f	1	4	1
Infant Wonder.....	1892	" 3	s	g	Sept. 6	f	5	8	8-9
Iron Mountain.....	1895	" 7	s	r	Oct. 13	f	7	1	9
Jacques Late.....	1890	" 3	s	g	Sept. 25	f	5	2	5-6
Japan Dwarf.....	1894	Apr. 29	l	r	Aug. 10	f	3		5-6
Jersey Yellow.....	1895	May 6	s	r	Oct. 15	f	3	1	4-5
Jones.....	1892	" 6	s	g	Sept. 24	s	7	1	4-5
June Rose.....	1894	" 6	l	g	" 6	f	5	1	6-7
Juno.....	1894	" 6	l	r		f			
Kalamazoo.....	1890	" 6	s	r	Sept. 20	f	4	3	7-8
Kallola.....	1892	" 4	l	r	" 17	f	5	8	3-4
Kraus 4.....	1895								
Kraus 16.....	1895								
La Fayette.....	1897								
La Fleur.....	1897	May 4	l	r	Oct. 5	f	3	1	2-3
Lancaster.....	1894			g					
Late Bernard.....	1894	May 7	s	r	Sept. 27	f	5	5	6-7
Late White.....	1889	" 7	s	r	Oct. 4	f	6	1	5
Lemon Free.....	1894	" 6	l	r	" 8	f	5	5	4
Lewis.....	1890	" 6	l	r	Aug. 26	f	4	5	6-7
Lock Cling.....	1892	" 7	s	r	Oct.	c		1	
Longhurst.....	1894	" 6	l	g	Sept. 27	f	6	1	5-6

## TABULATION OF PEACHES, 1897.—Continued.

Names.	Planted.	Bloomed.	Flowers—l, large; s, small.	Glands—g, globose; r, reniform; s, serrate.	Ripe.	Adhesion—g, clinging; f, free; s, semi- clinging.	Weight of speci- men in ounces.	Productiveness— Scale 1 to 10.	Quality—Scale 1 to 10.
Lorentz.....	1895	May 6	s	r	Oct. 15	f	3	1	5-6
Lovell.....	1892	April 29	s	r	Sept. 30	f	4	1	7-8
Lovett White.....	1890	May 7	s	r	" 30	f	5	2	6-7
Magdala.....	1890	" 7	s	r	" 8	f	3	1	5-6
Marshall.....	1890	" 7	s	r	Oct. 5	f	4	1	5-6
McCollister.....	1890	" 6	s	r	" 2	f	6	4	6
McKevitt <i>Cling</i> .....	1892	" 7	s	r	" 4	c	6	1	3-4
Milbizer.....	1892	" 7	s	r	" 15	f	4	1	5-6
Minnie.....	1890	" 7	s	r	Sept. 9	f	5	1	5-6
Moore.....	1890	" 7	s	r		f			
Morris County.....	1888	" 7	s	r	Sept. 2	f	3	1	3-4
Morris White.....	1888	" 10	s	r	" 22	f	5	1	9
Mountain Rose.....	1888	" 7	s	r	" 1	f	4	1	8
Muir.....	1890	" 7	s	r	" 25	f	6	1	6-7
Murat.....	1889	" 7	s	r	Oct. 8	f	8	1	4-5
Mystery.....	1888	" 7	s	r	Sept. 2	f	5	1	8
North American Apricot.....	1892	" 6	l	r		f		2	5-6
Nectarine.....	1888	" 6	l	r		f			
Need.....	1890	" 7	s	r	Sept. 7	f	4	1	5
Nell Marshall.....	1892	April 29	l	r	Oct. 15	f	3	2	4-5
Newington <i>Free</i> .....	1893	May 7	s	r	" 6	f	4	1	6
New Prolific.....	1894	" 6	s	r	Sept. 6	f	5	1	7
Normand.....	1892	" 7	s	r	Oct. 15	f	4	1	5
Oldmixon <i>Cling</i> .....	1888	" 7	s	r	Sept. 26	c	6	1	5
Oldmixon <i>Free</i> .....	1894	" 6	s	r	" 23	f	5	1	9-10
Orion.....	1894	" 4	l	r	" 27	s	4	4	4
Ostrander.....	1892	" 7	s	r	" 2	f	4	1	5-6
Pallas.....	1894	" 6	l	r	" 17	f	4	1	
Palmerston.....	1890	" 8	l	r	Oct. 5	s	7	1	7
Pansy.....	1890	" 8	s	r		f			
Pearl.....	1889	" 6	s	r	Sept. 20	f	5	1	7
Peninsular <i>Yellow</i> .....	1894	" 6	s	r	" 24	f	5	1	5
Pickett.....	1890	" 7	s	r	Oct. 5	c	4	4	5-6
Pratt.....	1890	" 7	s	r	Sept. 8	f	4	1	
Prince R. R.....	1890	" 7	s	r	" 20	f	4	1	7-8
Princess.....	1894	" 6	l	r	Oct. 6	f	4	1	8-9
Princess <i>Wales</i> .....	1889	" 7	l	r	Sept. 28	f		1	
Prize.....	1892	" 6	s	r	" 28	f	6	2-4	5-6
Prize 1.....	1890	" 7	s	r	Oct. 2	f	4	1	6
Red Cheek <i>Melocoton</i> .....	1893	" 6	s	r	" 4	f	5	1	5
Red Seedling.....	1893	" 6	l	r	Aug. 31	s	4	2	6
Reeves <i>Favorite</i> .....	1890	" 7	s	r	Sept. 20	f	4	1	6-7
Reid.....	1890	" 6	s	r	" 6	f	5	1	7-8
Ringgold.....	1890	" 7	s	r	Oct. 15	c	4	1	6-7
River Bank.....	1892	" 7	l	r	Aug. 2	s	5	2	5
Rivers.....	1888	" 6	l	r	" 10	f	5	5	6-8
Robena.....	1894			r					
Roser.....	1892	May 3	l	r	Oct. 18	f	4	2	2-3
Roseville.....	1892	" 7	l	r	" 4	c	6	1	6
R. S. Stevens.....	1891	" 8	s	r	Sept. 9	f	4	4-5	6
Salway.....	1890	" 6	s	r	Oct. 29	f	5	9	6
Scott.....	1890	" 6	s	r	" 4	f	5	2	7
Sener.....	1888	" 10	s	r		f			
Shipley.....	1890	" 7	s	r	Sept. 24	f	5	1	4-5
Smock <i>Free</i> .....	1888	" 7	s	r	Oct. 15	f	5	1	5-6
Smock.....	1892	" 6	s	r	" 8	f	6	2	5-6
Sneed.....	1896	" 4	l	r					
Snow <i>Late</i> .....	1890	" 7	s	r	Sept. 7	f	5	2	5-6
Southern Early.....	1890	" 6	s	r	" 7	f		1	
Spottswood.....	1894	" 7	l	r	" 18	f	4	1	6-7

TABULATION OF PEACHES, 1897.—*Concluded.*

Names.	Planted.	Bloomed.	Flowers—l, large; s, small.	Glands—g, globose; r, reniform; s, serrate.	Ripe.	Adhesion—c, cling; f, free; s, semi- cling.	Weight of speci- men in ounces.	Productiveness— Scale 1 to 10.	Quality—Scale 1 to 10.
Stark Heath	1892	May 6	s	r	Oct. 15	c	4	1	3
Steadley	1898	" 10	s	r	Sept. 2	f	4	1	7-8
Stevens Late	1890	" 7	s	r	Oct. 15	f	4	1	5-6
Stevens Rareripe	1892	" 7	s	r	" 2	f	5	3	7
St. John	1890	" 6	s	g	Aug. 26	f	4	1	7-8
Strong Mammoth	1892	April 30	s	g	Sept. 20	f	5	1	6
Stump World	1890	May 3	s	g	Aug. 31	f	4	4	6
Summer Snow	1894	" 6	l	s	Oct. 4	c	3	1	4-5
Surpasse Melocoton	1890	" 7	s	r	Sept. 6	f	4	1	8
Switzerland	1890	" 6	s	g	" 27	f	4	1	5-6
Tallman 1	1894			r		f			
Tallman 2	1894			g		f			
Tallman 3	1894	May 6	s	g		f			
Toledo	1894	" 7	l	g	Aug. 26	f	4	1	6
Toquain	1892	" 7	l	r	Sept. 25	f	4	5	7
Townsend	1892	" 6	s	g	" 30	f	6	1	5-6
Triumph	1896			g		f			
Troth	1890	May 6	s	g	Sept. 4	f	5	2	5-6
Tuskens	1892	" 6	s	r	Oct. 4	c	6	1	8-9
Wager	1890	" 6		r	" 2	f	4	4	4-5
Walker	1892	" 6	s	g		f		1	
Walker Var.	1893	" 6	s	g	Oct. 4	f	4	1	7-8
Washington	1890	" 6	s	r	Sept. 23	f	6	1	6-7
Willett	1894	" 6	l	g	" 30	f	4	1	5-6
Williamson	1892	" 6	s	g	" 29	f	6	1	5-6
Wonderful	1890	" 6	s	r	Oct. 4	f	6	2	5
Worthen	1890	" 7	s	r	Sept. 6	f	6	1	8
Yellow Rareripe	1898	" 7	s	g	" 18	f	4	1	3-4
Yenahi Hardy	1896	" 7	l	r				1	
York Pearl	1896		s						
Zea	1897								

As the natural result of overproduction last year, the set of peaches the present year has been very light. This result has doubtless been emphasized as the consequence of unusually unfavorable weather during the season of blooming, and the prevalence of leaf curl during the setting of the fruit.

Under such conditions the result, as shown in the foregoing tabulation, should be accepted as a more or less uncertain indication of the ability of the varieties to withstand unfavorable influence rather than a trustworthy evidence of their comparative value under average conditions.

Of those tabulated, Advance, Early Red, La Fayette and Zea are recent seedlings originated by C. Engle of Paw Paw, Michigan, and first planted here in April last.

Of the fourteen varieties ranking in productiveness, as high as five in the scale one to ten, only one, received from Missouri as Infant Wonder, grades as high as eight to nine in quality.

Toquain, a recent Michigan variety, from the town of that name, grades as high as seven in quality.

Barber, an Allegan county seedling; Late Barnard, origin unknown; Lewis, from Allegan county, and Rivers, originating in England, range from six to seven.

Brown, of Berrien county, Michigan; R. S. Stevens, from Western New York, and Salway, of England, grade at six.

Allen and Cleffey *Allen*, place of origin not known, at five.

Bickell, Southern Early, Crosby (from Massachusetts) and Lemon *Free*, origin not known, rank as low as four to five in quality.

Blood Leaf, though productive, is valueless so far as the fruit is concerned, though a curiosity, on account of the dark brownish red color of its foliage.

Arctic and Bokara are on trial with the hope that they may prove unusually hardy and hence better adapted to northern latitudes.

Crane was received, under this name, from Allegan county, but with the understanding that it was identical with St. John. It proves to be a fair yellow peach, though much later than the true St. John.

Crosby has produced far more than the average of this year, with the quality somewhat above medium, while the weight of a specimen is slightly under the average.

Elberta has this year fruited very sparsely. It is reputed generally, to be specially liable to leaf curl. Experience so far would seem to warrant the suspicion that it may fail to permanently maintain its present popularity in our northern climate.

Hinman, as received here, was for a time understood to be identical with Barber. It, however, proves to be distinct, so far as trial trees received here are concerned. Whether or not this is an old variety renamed is yet to be determined.

Hyatt, Hynes, Infant Wonder, Jones, Red Seedling and River Bank are semi-clings of the Hale-Amsden type, differing but slightly, save in season of ripening.

Ice Mountain and Iron Mountain may probably be desirable in a more southern latitude, though so late as to be worthless here. Brett, *Mrs.*, identity doubtful, as received here, is as late as the foregoing, although said to be prized at Newburg, N. Y., where it originated. Strangely enough Downing (Appendix, page 143) gives the leaf glands as both globose and reniform.

June Rose is said to be more recently renamed Superb, by what authority we are not informed.

McCollister still maintains its status for quality, and is confidently commended as the most promising yellow market peach for middle and late September.

Minnie, received from Texas in 1890, ripens here in ordinary seasons early in August, and is of more than medium quality. Another of this name, coming from an unknown source, through the Agricultural College, ripening in late September in ordinary seasons, is of lower quality and less productive.

Sneed and Triumph come to us from the south with high recommendation, but have not yet fruited here. Their alleged earliness may prove less important at the north, since they must compete in the market with the later varieties of the south.

Tallman 1, 2 and 3 come to us as Lenawee county seedlings. Fruit of No. 1 sent for examination was of very high quality and apparently of special value as a variety for the home.

Wager has been received from several sources, but so far we are far from certain that any of them are true to name. The variety is reputed

to reproduce itself from the pit. This assumption, if but partially true, may account for the above result.

Worthen *Jennie*, which comes from Texas, proves to be of superior quality here.

#### GRAPES.—*Vitis*.

The past season has been scarcely as favorable as usual for this fruit, and while all have matured later than usual, several of the later and less hardy varieties have scarcely reached their full color and flavor.

On April 12 to 15 one pound of copper sulphate in 25 gallons of water was applied.

On August 23, mildew having appeared upon a few plants, they were sprayed with a solution of one pound of copper sulphate in 250 gallons of water.

The season throughout, having been unusually dry in this immediate locality, grapes have been quite generally exempt from the attacks of fungi.

The only troublesome insect observed this season is the black aphid, which attacks the tips of the growing canes. In some cases the affected tips have been cut away and burned, while in others they have been subdued by applying a strong decoction of tobacco stems.

The stakes upon which the vines in the southwest block have heretofore been trained have now been replaced by a two-wire trellis, upon which the plants are being trained, on what is commonly known as the Kniffin system.

The unusual exemption from frost, with mild weather and slight rains, till past the middle of November, has resulted in the very general retention of foliage till near the present time (November 24), so that the pruning of grapes, which is usually done in autumn, is yet in progress.

For convenience in consulting and comparing varieties, grapes are arranged alphabetically in a single table, and their species, or parentage, given in a column devoted to that purpose.

In such column the known, or inferred, species of the seed parent is first given; and, in case of actual or inferred hybridization, the species of the actual or supposed pollenating parent is appended with an x.

The usual abbreviations of specific names are employed in such column.

Tabulation of Grapes—*Vitis*—1897.

Abbreviations—Bunch: c, compact; cy, cylindrical; l, large; o, open; r, roundish; s, shouldered. Berry—Form: l, large; m, medium; o, oval or ovate; r, round; s, small. Color: a, amber; b, black; g, greenish; p, purplish; r, reddish; w, whitish; y, yellowish.

No.	Names.	Species.	Bloomed.	Ripe.	Received from.	Vigor—Scale 1 to 10.	Productiveness—Scale 1 to 10.	Quality—Scale 1 to 10.	Bunch.		Berry.		
									Form.	Weight in ounces.	Form.	Size.	Color.
1	Adirondac	Lab. x Vin.	June 29	m Sept.	Ell. & Berry	6	1	4.5	lcs	5	r	5-8	b
2	Agawam	Lab. x Vin.	" 30	m Oct.	Hubbard	8-9	8-4	6-7	lcs	5	r	5-9	p b
3	Alice	Lab.	June 23	b Oct.	T. J. Dwyer	10	5	7-8	ls	1	r	7-8	b
4	Ambria	Lab. x Vin.	" 28	b Oct.	Hubbard	10	1	7-8	ls	1	r	6-7	r b
5	August Giant	(Vul. x Lin.) x Vin.	" 28	e Sept.	Hubbard	9-10	1	7	rcs	4	r	8-9	b
6	Berry	Lab. x Vin.	June 24	e Sept.	Hubbard	10	10	8	cy r	4	r	8-9	b
7	Beagle	(Rip x Lab.) x Lab.	" 28	e Sept.	Munson	8-9	6	4-5	cs	5	r	5-6	b
8	Bel.	Vul. x (Bour. x Lab.)	" 24	m Oct.	Ag. Col.	10	2	8-9	ls	4	r	5-6	r
9	Belvidere	Lab. x Vin.	" 30	b Oct.	Ag. Col.	7	3	5-6	lcs	4	r	5-6	gw
10	Berkmans	Vul. x (Bour. x Lab.)	" 30	e Sept.	Hubbard	7	5	6-7	lcs	4	r	4-5	b
11	Berlin	Lab. x Vin.	" 30	m e Sept.	Hubbard	10	1	3-4	cy s	2	r	5-6	w
12	Black Eagle	(Rip x Lab.) x (Lab. x Vin.)	July 2	e Sept.	Munson	8-10	8	10	ls	6	r	5-6	r
13	Black Pearl	Lab. x Vin.	June 30	m e Sept.	Munson	8	8	7	cs	4	r	4-5	b
14	Blanco	Lab. x Vin.	" 29	e Sept.	Hubbard	8	3	8	cs	3	r	6-7	b
15	Brighton	Lab. x Vin.	June 20	e Oct.	Hubbard	8	4	8-9	ls	3	r	6-7	r
16	Brilliant	Lab. x Vin.	June 30	m e Sept.	Munson	8	8	7	cs	4	r	4-5	b
17	Burnet	Lab. x Vin.	" 29	e Sept.	Ell. & Berry	8	3	8	cs	3	r	6-7	b
18	Cambridge	Lab. x Vin.	June 29	e Oct.	Barnhart	8	4	8-9	ls	3	r	6-7	r
19	Campbell Early	Lab. x Vin.	June 29	m e Sept.	Hubbard	10	2	8-4	l	6	r	5-6	w
20	Catawba	Lab. x Vin.	July 2	m Oct.	Caywood	5	10	10	cy s	3	r	3-4	w
21	Caywood, 50	Lab. x Vin.	June 29	m e Sept.	Campbell	10	10	10	cy s	3	r	3-4	w
22	Centennial	Lab. x Vin.	" 30	b Sept.	Hubbard	10	8	9	cs	1	r	4-5	b
23	Challenge	Lab. x Vin.	" 30	m e Sept.	Hubbard	8	1	9	rs	1	r	3-4	r
24	Champion	Lab.	" 29	e Sept.	Chidester	9	1	7-8	r	3	r	4-7	r
25	Chidester, 3	Lab.	June 30	b Oct.	Chidester	10	7	4	cy s	3	r	4-8	b
26	Chidester, 4	Lab.	" 29	m e Sept.	Dir. Post	10	7	4	cy s	3	r	3-6	b
27	Clark	Vul. x Lab.	June 30	m e Sept.	Barnhart	10	7	4	cy s	3	r	3-6	b
28	Cleaver	Vul. x Lab.	" 30	m e Sept.	Hubbard	10	7	4	cy s	3	r	3-6	b
29	Clinton	Vul. x Lab.	" 30	m e Sept.	Hubbard	10	7	4	cy s	3	r	3-6	b
30	Colerin	Lab. x Lab.	" 30	m e Sept.	Farmar	10	5	8-9	l	6	r	5-7	lg
31	Columbia	Vul. x Lab.	" 30	m Oct.	E. & B.	7	7	5	l	3	r	6-7	a
32	Columbian	Lab.	" 30	b Oct.	Farmar	10	1	17	l	3	r	6-7	a
33	Concord	Lab.	" 30	b Oct.	Home	8-10	5-8	5-6	cy s	7	r	5-6	p

34	Cortland	Lab.	"	28	m Sept.	Lambert	10	1	2-3	os	3	r	5-6	b
35	Cottage	Lab. x Vin.	"	28	b Oct.	Hubbard	7	4-5	8-9	cy	4	r	4-7	b
36	Cravelling	Lab. x Vin.	"	28	e Sept.	Hubbard	10	5	8-9	os	3	r	2-3	b
37	Delaware	Bour. x Lab. ?	"	28	b Oct.	Hubbard	5-6	8-9	7-8	os	6	r	5-6	w
38	Diamond	Lab. x Vin.	"	29	m e Sept.	Chase	8	2	7-8	os	6	r	5-6	w
39	Diana	Lab. x Vin.	"	28	m Oct.	Hubbard	10	1	7-8	ccy	4	r	5-6	r
40	Downing	Lab. x Vin.	"	28	m Oct.	Hubbard	4-5	8	8-9	os	11	o	7-8	b
41	Dracut	Lab. x Vin.	July 1	28	e Sept.	Hubbard	10	1	2-3	os	6	r	6-8	a
42	Duchess	Lab. x Vin.	June 30	28	m Oct.	Hubbard	8-9	1	7	os	6	r	3-4	g
43	Early Golden	Lab. x Vin.	"	28	m Oct.	Munson	10	10	7-8	cs	3	r	4-5	b
44	Early Market	Lab. x Vin.	June 28	28	m e Sept.	Hubbard	10	5	7-8	l	8	r	7-9	b
45	Early Victor	Lab. x (Bour. x Lab.)	"	28	m e Sept.	Hubbard	9	1	7-8	l	8	r	6-7	r
46	Elston	Lab. x Vin.	"	30	m e Sept.	Eagle	7	1	7-8	l	8	r	6-7	r
47	Elton	Lab. x Vin.	"	30	m e Sept.	Hubbard	9	1	7-8	l	8	r	6-7	r
48	El Dorado	Lab. x Vin.	"	30	m e Sept.	Hubbard	7	1	7-8	l	8	r	6-7	r
49	Elvira	Lab. x Vin.	"	30	m Oct.	Hubbard	10	5	4-5	cy	4	r	5-7	w
50	Empire State	Lab. x Vin.	"	30	m Oct.	Hubbard	10	5	8-9	os	6	r	3-4	w
51	Essex	Lab. x Vin.	"	30	m Oct.	Hubbard	8-9	2	6-7	os	3	o	5-8	r
52	Ether	Lab. x Vin.	"	30	m Oct.	Hubbard	8-9	1	6	cy	7	r	6-7	w
53	Etta	Lab. x Vin.	"	30	m Oct.	Jesselyn	10	5	4-5	os	7	r	6-8	w
54	Eugenie	Lab. x Vin.	"	29	b Oct.	Ell & Barry	7	1	8	lo	5	r	5-6	b
55	Eunice	Lab. x Vin.	"	28	b Oct.	Hubbard	10	7	8	os	2	r	5-6	w
56	Eunice	Lab. x Vin.	"	28	b Oct.	Hubbard	7	1	8	os	2	r	5-6	w
57	Excelsior	Lab. x Vin.	"	24	b Oct.	Hubbard	7	1	8	os	2	r	5-6	w
58	Faith	Lab. x Vin.	June 30	30	m Sept.	Ag. Col.	8-9	1	7-8	cy l s	1	r	4-5	la
59	Gertner	Lab. x Vin.	"	28	m Oct.	Hubbard	10	1	5-6	lc	2	o	6-7	r
60	Geneva	Lab. x Vin.	"	28	m Oct.	Chase	9	3	8-9	lc	2	o	6-7	w
61	Gothe	Lab. x Vin.	"	28	m Oct.	Hubbard	7	1	8-9	cy	2	o	1	yg
62	Golden Drop	(Lab. x Vin.) x (Bour. x Lab.)	"	28	m e 8-pt.	Hubbard	5	8	9-10	cy	2	r	3-4	w
63	Golden Gem	(Bour. x Lab.) x Vin.	"	30	b Oct.	Campbell	5	8	10	cy	2	r	2	w
64	Goldstein	Lab. x Vin.	June 28	28	Early	Thompson	10	6	6-7	large	4	o	large	large
65	Goldvee	Lab. x Vin.	"	28	Sept.	Eagle	10	5	6-7	cy	4	o	6-8	w
66	Hall	Lab.	"	28	b Oct.	Hall	10	5	6-7	cs	4	r	3-7	b
67	Hartford	Lab.	"	28	e Sept.	Hubbard	6-7	1	3-4	os	6	r	3-6	w
68	Hayes	Lab.	July 2	28	m e Sept.	Hubbard	10	1	6-7	cy	4	r	3-4	w
69	Herbert	Lab. x Vin.	June 28	28	b Oct.	Hubbard	10	1	6-7	cy	4	r	6-8	b
70	Honey	Lab. x Vin.	"	30	m Oct.	Eagle	8	1	7-8	cy	4	r	6-7	w
71	Hosford	Lab. x Vin.	"	30	m Sept.	Hosford	8	6	5-6	cy	6	r	9-10	b
72	Iona	Lab. x Vin.	July 2	28	m Oct.	Hubbard	8-9	9	10	os	5	o	3-6	r
73	Iris	Lab. x Vin.	"	1	b Oct.	Eagle	10	1	5-6	rs	5	o	6-7	r
74	Isabella	Lab. x Vin. ?	June 28	28	m e Oct.	Hubbard	10	7	8	l s	4	o	6-7	b
75	Ives	Lab.	"	28	e Sept.	Hubbard	8	10	3-4	cy	5	r	4-5	b
76	Jennerville	Lab. x Vin.	"	28	b Oct.	Hubbard	10	18	8-9	cy	4	r	5-6	b
77	Jefferson	Bour. x Lab.	July 1	28	m Oct.	Hubbard	8-9	10	8-9	cy	4	r	4-5	w
78	Jessica	Bour. x Lab.	June 28	28	m Sept.	Smith	8-9	8	6-7	cy	4	r	4-5	w
79	Jewell	Bour. x Lab.	"	30	m Sept.	Stayman	7	1	6-7	cy	3	r	3-4	b



Tabulation of Grapes, 1897—Concluded.

No.	Names.	Species.	Bloomed.	Ripe.	Received from.	Vigor—Scale 1 to 10.	Productiveness— Scale 1 to 10.	Quality—Scale 1 to 10.	Bunch.		Berry.		
									Form.	Weight in ounces.	Form.	Size.	Color.
80	Josselyn 5, 2, 1	Lab.	June 29	b m Oct.	Josselyn	10	10	8-6	ovs	4	z	6-7	z z
81	Josselyn 7, 2, 1	Lab.	July 2	m Oct.	Josselyn	9	10	8-6	ovs	4	z	6-6	z z
82	Josselyn 9, 2, 1	Lab.	June 29	m Oct.	Josselyn	9	1	8-6	ovs	4	z	6-6	z z
83	Josselyn 10, 2, 1	Lab.	July 2	m Oct.	Josselyn	8	9	6	ov	4	z	6-7	z z
84	Lady	Lab.	June 28	m Sept.	Josselyn	8	9	6	ov	4	z	6-7	z z
85	Leader	Lab.	" 29	b Oct.	Josselyn	6	1	5-6	ovs	4	z	6-6	z z
86	Leavenworth	Lab.	" 29	b Oct.	Stayman	10	1	5-6	ovs	4	z	6-7	z z
87	Lindley	Lab.	" 29	e Sept.	Hubbard	9	2	6-7	ovs	4	z	6-7	z z
88	Lutie	Lab.	" 29	m Sept.	Parry	9	2	2-3	ovs	4	z	6-7	z z
89	Lyon	Lab.	" 29	b Oct.	Childster	10	8	8-6	ov	4	z	6-7	z z
90	Mason, Mrs.	Lab. x Vin. ?	July 1	e Sept.	Mason	10	1	6-7	ovs	4	z	6-6	z z
91	Massasoit	Lab. x Vin.	June 28	e Sept.	Hubbard	8	4	6-7	ovs	4	z	6-6	z z
92	Merrimac	Lab. x Vin.	June 30	e Sept.	Hubbard	8-9	2-3	7-8	ovs	4	z	6-6	z z
93	Michigan	Lab. x Vin.	" 30	m Sept.	Engle	10	1	7-8	ovs	4	z	6-6	z z
94	Millington	Lab.	" 29	e Sept.	Palmer	6	1	5	ovs	4	z	6-6	z z
95	Mill	Lab. x Vin.	July 1	b m Oct.	Ell & Barry	8-9	5	10	ovs	4	z	6-6	z z
96	Minnesota	Lab. ?	June 28	m Oct.	Graham	10	1	4-5	ovs	4	z	6-6	z z
97	Monroe	(Bour. x Lab.) x Lab.	June 28	m Oct.	E. & B.	10	1	6	ovs	4	z	6-6	z z
98	Moore Early	Lab.	" 28	m Sept.	Hubbard	10	3	5	ovs	4	z	6-6	z z
99	Moyer	Bour. x Lab. ?	" 28	m Sept.	Hubbard	7-8	1	4-5	ovs	4	z	6-6	z z
100	Naomi	(Lab. x Vul.) x Vin.	" 22	"	Hubbard	10	1	1	ovs	4	z	6-6	z z
101	Nectar	Lab. x (Bour. x Lab.)	July 1	b m Oct.	Caywood	10	1	5-6	ovs	4	z	6-6	z z
102	Niagara	Lab.	" 1	b Oct.	Hubbard	10	1	5-6	ovs	4	z	6-6	z z
103	Northern Light	Lab.	" 1	b Oct.	Bucke	5-6	1	7-8	ovs	4	z	6-6	z z
104	Olita	Lab. x Vin.	" 1	b Oct.	Engle	5	2	6	ovs	4	z	6-6	z z
105	Onaida	Lab. x Vin.	June 28	b Oct.	Hubbard	7	1	5	ovs	4	z	6-6	z z
106	Osage	Lab.	" 28	b Oct.	Stayman	10	4	4-5	ovs	4	z	6-6	z z
107	Owosso	Lab.	" 30	e Sept.	Ell & Barry	10	4	4-5	ovs	4	z	6-6	z z
108	Osark	Lab.	July 4	m Oct.	Stayman	10	5	5-6	ovs	4	z	6-6	z z
109	Peabody	Vul.	June 30	m e Sept.	Campbell	8	8	5-6	ovs	4	z	6-6	z z
110	Perkins	Lab.	" 28	b Oct.	Hubbard	10	5	2	ovs	4	z	6-6	z z
111	Pocklington	Lab.	" 30	m Oct.	Hubbard	8	6	6-7	ovs	4	z	6-6	z z
112	Poughkeepsie	Bour. x Lab.	" 30	m Oct.	Hubbard	2-3	10	9-10	ovs	4	z	6-6	z z
113	Prentiss	Lab. x Vin.	" 30	m Oct.	Hubbard	10	10	7-8	ovs	4	z	6-6	z z
114	Presley	(Lab. x Vul.) x Lab.	" 24	e Sept.	Munson	9	10	4-5	ovs	4	z	6-6	z z

115	Progress (Norfolk?)	Lab. x Vin.	"	30	e Sept.	Stayman	10	3	4-5	10	3	10	5-6	b
116	Empress	Lab. x Vin.	July 1	30	e Sept.	Hubbard	10	5	5-8	10	5	10	5-6	b
117	Ranta	Lab. x Vin.	July 2	30	e Sept.	Campbell	8-9	5	7-8	8-9	5	10	5-6	b
118	Requa	Lab. x Vin.	"	28	m e Sept.	Ell. & Barry	7-8	4-5	6-7	7-8	7	10	4-5	r d
119	Rochester	Lab. x Vin.	"	28	m e Sept.	Ell. & Barry	7-8	4-5	6-7	7-8	7	10	4-5	r d
120	Rockwood	Lab.	"	30	e Sept.	Joeselyn	9	1	7-8	9	1	10	5-6	b
121	Rogers 5	Lab. x Vin.	"	28	e Sept.	Hubbard	9	5	7	9	5	10	5-6	b
122	Rogers 8?	Lab. x Vin.	"	29	e Sept.	Hubbard	10	6	6-7	10	6	10	6-7	b
123	Rogers 24	Lab. x Vin.	"	24	e Sept.	Hubbard	10	1	6-7	10	1	10	6-7	b
124	Rogers 30	Lab. x Vin.	"	30	b Oct.	Hubbard	10	1	5	10	1	10	6-7	b
125	Rommel	(Lab. x Vul.) x Vin.	"	30	e Sept.	Munson	8-9	2	5-6	8-9	2	10	5-6	b
126	Salom	Lab. x Vin.	"	30	e Sept.	Hubbard	10	5	5-6	10	5	10	5-6	b
127	Secretary	(Lab. x Vul.) x Vin.	"	28	m Oct.	Ell. & Barry	5	10	5	5	10	10	5-6	b
128	Telegraph	Lab.	"	30	m Sept.	Hubbard	7	8	5	7	8	10	5-6	b
129	Thermis (incorrect)	Lab. x Vin.	July 2	30	e Sept.	Eagle	9	7	5-6	9	7	10	5-6	b
130	Triumph	Lab. x Vin.	"	2	Nov.	Campbell	10	7	8-9	10	7	10	5-6	b
131	Uster	Lab. x Vin.	June 24	2	m Oct.	Caywood	5-6	9-10	9-10	5-6	11	10	5-6	b
132	Vergennes	Lab.	"	29	e Sept.	Hubbard	7-8	8-9	8-9	7-8	5	10	5-6	b
133	Vesta	Lab. x Vin.	"	26	e Sept.	Eagle	9	1	5-6	9	1	10	5-6	b
134	Victoria (black)	Lab.	"	29	e Sept.	Joeselyn	10	1	6	10	1	10	5-6	b
135	Victoria (white)	Lab.	"	30	e Sept.	Campbell	7	1	7	7	1	10	5-6	b
136	Warder	Lab.	"	30	e Sept.	Huber	5	1	5	5	1	10	5-6	b
137	Washington, Lady	Lab. x Vin.	July 2	30	m Oct.	Hubbard	7	1	7	7	1	10	5-6	b
138	Wells	Lab.	June 29	29	b Oct.	Robards	9	5	9	9	5	10	5-6	b
139	White Ann Arbor	Lab.	July 1	1	b Oct.	Scott	7	5	5	7	5	10	5-6	b
140	White Beauty	Lab. x Vin.?	June 29	29	b Oct.	Stayman	8	4	8	8	4	10	5-6	b
141	White Imperial	Lab. x Vin.?	"	29	b Oct.	Stayman	7-8	1	7-8	7-8	2	10	5-6	b
142	Wild	Lab. x Vin.	"	28	m Oct.	Hubbard	10	1	5-6	10	1	10	5-6	b
143	Willis	Bour. x Lab.?	"	28	m Sept.	Campbell	10	1	8-9	10	1	10	5-6	b
144	Winchell	Lab. x Vin.	"	29	b Sept.	Ell. & Barry	10	1	8-9	10	1	10	5-6	b
145	Witt	Lab. x Vin.	"	30	b Oct.	Campbell	10	4	7-8	10	4	10	5-6	b
146	Woodruff	Lab. x Vin.	"	24	b Oct.	Scott	9-9	5	4-5	9-9	5	10	5-6	b
147	Worden	Lab.	"	26	m e Sept.	Hubbard	10	2	7-8	10	2	10	5-6	b
148	Wyoming	Lab.	"	30	m e Sept.	Hubbard	8-9	2	4	8-9	2	10	5-6	b

Of many varieties, plants of fruiting age have proved unproductive during the past season; a result perhaps due, in whole or in part, to unseasonably cold winds from Lake Michigan during the blossoming season.

Unseasonably cool weather also occurred during the season of ripening, which was from two to three weeks later than usual. Owing apparently to these facts, certain varieties have failed to fully develop their usual quality.

Adirondac originated at the foot of the Adirondac mountains, near Lake Champlain. It was first brought to notice by the exhibit of beautiful, ripe, luscious clusters at a meeting of the American Pomological Society, at Boston, and a report of the committee on native fruits commended it very highly, but away from its original locality it has generally proved a decided failure.

Agawam, alphabetically, leads the entire list of the Rogers' hybrids, of which seventeen appear in the foregoing tables. While they afford a surprisingly high average result of a single set of pollinations of *vinifera* upon our wild *labrusca*, it is doubtful if any of them possess qualities which will insure their permanent popularity. With these, as well as (with rare exceptions) with all hybrids with *vinifera*, the increased liability to mildew in many if not most American climates, demands more careful and thorough preventive treatment than most cultivators are accustomed to bestow.

To this as to most general rules, experience here would indicate occasional exceptions. Among such we especially note the Downing, which, although in foliage and habit of growth giving decided evidence of *vinifera* parentage, has proved healthy and productive, of very large clusters, of superior quality, often keeping in good condition till March, with only ordinary care. Much the same may also be said of Jefferson and Mills.

Brighton, though slightly liable to mildew, is so admirable in quality as to richly deserve a place in the home plantation. It needs the proximity of some other variety as a fertilizer.

Delaware is, by many experts, believed to be partially of *vinifera* parentage. Here it has proved healthy and productive, although experience elsewhere would indicate that it may be fastidious as to soils or modes of treatment.

Beagle, Bell, Blanco, Brilliant, Early Market, Presley and Rommel are seedlings by T. V. Munson, the noted expert of Denison, Texas. Several years trial indicates that they are not adapted to the climate of this locality.

Berlin, white, and Hosford, black, are seedlings originated by George Hosford of Ionia, Michigan. They are understood to be of pure *labrusca* parentage (Concord seedlings), and experience so far affords promise of value as market varieties.

Chidester 3, purple, and Chidester 4, red, received in 1892; also Lyon, white, received in 1895, are seedlings by C. P. Chidester of Battle Creek, Michigan. No. 3 is very early, and Lyon is large, beautiful and of fine quality. All are healthy and vigorous.

Elaine, Guinevra, Honey, Iris, Michigan, Olita, Pulpless and Vesta are seedlings by C. Engle of Paw Paw, Michigan. All are understood to be from seeds of Salem, or some other of the Rogers' hybrids, and hence to belong with the family, *lab. x vin.* Many of them manifest more or less

strongly the distinctive characteristics of that family. Further trial is needful to properly determine their relative value.

Alice, received from T. J. Dwyer of Cornwall, N. Y., in 1896, and Goldstein, originating in Mississippi, and received from Thompson's Sons of Rio Vista, Virginia, in 1897, appear to be healthy and vigorous, but, of course, are not yet fruiting.

Campbell Early was received from Geo. S. Josselyn of Fredonia, N. Y., the introducer, who also sent specimens of the fruit when at maturity. The growth of spring set plants, as well as the character of the fruit received, indicate that it will probably sustain the high character given it by its originator, Geo. W. Campbell of Ohio.

Plants of four varieties, Josselyn No. 5, white; No. 7, white; No. 9, black; and No. 10 (not yet in fruit) were received from Mr. Josselyn in 1891. These rank from 8 to 10 in vigor, and the first three appear promising as market varieties.

Esther and Rockwood, received from the same source in 1892, are both above medium in quality; productiveness yet undetermined.

Plants of a seedling originating with Mrs. Mason of Ottawa county, Michigan, were received for trial in 1892, and have now fruited. The bunch is small, compact; berry, dark reddish amber and of fair to excellent quality.

Victoria, the white variety originated by the late T. B. Miner, was received in 1892 from Geo. W. Campbell of Ohio. A variety under this name, but black in color, has been received from two or three other sources. It is apparently not Ray's Victoria, which is light amber in color.

#### PLUMS.—*Prunus*.

The pruning of plums was commenced on March 20th and continued from time to time as weather permitted. The work was completed on March 27th.

Examination by Prof. Taft betrayed the presence of Putnam scale upon several plum trees, on March 31st these being yet dormant were sprayed with kerosene emulsion, consisting of one-fourth kerosene as applied to a part of the trees, and one-sixth kerosene as applied to others. Owing to strong wind, the emulsion could only be applied to one side of the trees at this time.

On April 1st and 2d the remaining plums were treated with emulsion consisting of five gallons of kerosene, six pounds of whale oil soap and forty gallons of water.

On June 26th large numbers of aphides were discovered upon several plum trees. These were treated with a strong decoction of tobacco. This so far stupified them that they dropped to the ground, apparently dead.

They, however, recovered after several hours, and started to resume their attack upon the foliage, but were treated this time with emulsion, composed of a gallon of kerosene and a gallon of whale oil soap in fifty gallons of water, which proved effectual.

July 1st and 2d shot-hole fungus and also brown rot of the fruit appearing upon several plum trees, they were sprayed with Bordeaux mixture, using four pounds of copper sulphate and six pounds of stone lime, in fifty gallons of water.

July 22d several plum trees bearing heavy crops of fruit were thinned, and as the fruit on two or three of them was becoming shriveled, owing to extremely hot weather and severe drouth, they were copiously watered by drawing back the earth, and forming a basin about the trunk, filling the same with water, and replacing the earth after the water had been absorbed. Within a few hours the fruit resumed its original plumpness.

Jarring for curculio was commenced on May 29th, finding a few only. This was repeated frequently, so long as considerable numbers of insects were caught. They have not occurred in large numbers this year.

The rose chafer has been almost wholly absent this season.

The aphid has been unusually abundant and persistent, especially upon the plum.

Tubulation of Plums—*Prunus*—1897.

Abbreviations—l, long; o, oval; ob, oblate; r, roundish; b, black; g, greenish; p, purple; r, red; w, whitish; y, yellowish; o, cling; f, free; s, semi-cling.

No.	Names.	Species.	Planted.	Vigor—Scale 1 to 10.	Bloomed.	Ripe.	Form.	Color.	Adhesion.	Weight of specimen in ounces.	Productiveness—Scale 1 to 10.	Quality—Scale 1 to 10.	Remarks.
1	Abundance	Triflora	1895	9-10	May 7	Aug. 21	ro	r	---	---	1	5-9	Very productive as the name implies.
2	Agon	Domestica	1890	6-7	" 8	Sept. 6	o	p	f	1	6	6-7	Old. Now largely superseded.
3	Arch Duke	Domestica	1897	8-9	" 8	" 8	ro	b	f	2	6	8-4	Not yet fully tested here.
4	Arctic	Domestica	1890	8-9	" 8	Aug. 27	ro	b	f	1	6	5	Named for alleged hardness.
5	Bailey	Triflora	1897	---	---	---	---	---	---	---	---	---	Not yet fruited here.
6	Bayer	Domestica	1890	7-9	May 7	Sept. 30	r	gy	o	2	5	10	Reine Claude of nurseries—erroneously.
7	Berkmans	Triflora	1897	---	---	---	---	---	---	---	---	---	Not yet fruited here.
8	Black Diamond	Domestica	1892	9	May 8	Sept. 8	o	b	f	2	3	5-6	A large, promising market plum.
9	Black Prune	Domestica	1893	5-6	" 4	Aug. 21	ro	r	---	---	1	5-6	Not sufficiently tested here.
10	Botan	Triflora	1890	9	" 4	Aug. 21	ro	r	---	---	---	---	Abundance is identical with this.
11	Bradshaw	Domestica	1890	9-10	" 8	" 25	o ob	p b	f	2	1	6-7	A leading market plum.
12	Burbank	Triflora	1893	10	" 5	" 28	ro	yr	c	2	4	6	Tree vigorous, spreading, productive.
13	Clyman	Domestica	1894	7	May 9	Sept. 25	o	y	f	2	1	8	Not yet fruited here.
14	Coe Golden Drop	Domestica	1893	8-9	May 9	Aug. 27	r	p	f	2	1	7-9	Late, excellent, productive.
15	Columbia	Domestica	1893	8	" 8	Oct. 6	r	p	---	---	---	---	Large, beautiful, good.
16	Cook	Hortulana	1890	8	" 11	Oct. 6	r	p	---	---	---	---	Valueless here.
17	Czar	Domestica	1892	8-9	" 8	---	ro	---	f	2	1	7-9	But partially tested here.
18	Cesar Salva	Domestica	1895	---	---	---	---	---	---	---	---	---	Introduced from Austria-Hungary.
19	Dr. Uff	Domestica	1894	5	May 10	---	---	---	---	---	---	---	From above source.
20	Dr. Uff Salva	Domestica	1895	3	---	---	---	---	---	---	---	---	From above source.
21	Dunlap	Domestica	1896	---	---	---	---	---	---	---	---	---	Not yet fruited here.
22	Elwood	Domestica	1896	10	May 8	Aug. 18	ro	y	f	1	8	7-8	Not yet fruited here.
23	Engle	Domestica	1890	8	" 8	Sept. 6	ro	b	f	1	5	6-7	Excellent, but too small.
24	Englebert	Domestica	1896	9-10	May 8	---	---	---	---	---	---	---	Market. A Belgian seedling.
25	Fellenberg	Domestica	1892	---	May 8	Aug. 27	o	b	c	1	5	6-7	Italian Prune of Downing.
26	Field	Domestica	1896	9-10	May 8	---	---	---	---	---	---	---	Needs further trial.
27	Foot	Domestica	1896	5	---	---	---	---	---	---	---	---	Not yet fruited here.
28	Forest Garden	Americana	1899	5-6	May 11	Sept. 25	r	---	---	---	---	---	Not desirable here.
29	Forest Rose	Hortulana	1890	5	" 12	Oct. 15	r	---	---	---	---	---	Not desirable here.
30	Freestone Quetsche	Domestica	1894	7-8	May 8	Sept. 20	r	b	c	1	1	7	Imported by Division of Pomology.
31	French Damson	Domestica	1893	10	May 8	---	---	---	---	---	---	---	Not fully tested here.
32	French Prune	Domestica	1894	10	" 10	---	---	---	---	---	---	---	Not fully tested here.
33	Garfield	Hortulana	1899	9	" 13	---	---	---	---	---	---	---	Southern. Worthless here.

Tabulation of Plums—Prunus—1897—Concluded

No.	Names.	Species.	Planted.	Vigor—Scale 1 to 10.	Bloomed.	Ripe.	Form.	Color.	Adhesion.	Weight of specimen in ounces.	Productiveness—Scale 1 to 10.	Quality—Scale 1 to 10.	Remarks.
34	Giant Prune.....	Domestica	1895	8	May 10	Sept. 21	o	p	f	2	1	6.7	New. Needs further trial.
35	Glass.....	Domestica	1890	9	" 7	Aug. 31	r	p	c	2	1	6.7	First fruited here this season.
36	G. No. 4.....	Domestica	1890	9-10	" 8	Aug. 31	r	p	c	1	1	7-8	New York. So far unproductive.
37	Gold.....	Triflora	1895	6-7	" 17								Seedling by Luther Burbank.
38	Golden Prune.....	Domestica	1894										Not yet fruited here.
39	Grand Duke.....	Domestica	1890	8-9	May 6	Sept. 9	o	p b	c	3	2	4-5	Very promising for market.
40	Genii.....	Domestica	1890	9	" 8	Sept. 2	r	p	f	1	3	5-6	A popular market plum.
41	Hale.....	Triflora	1896	10	" 8								Japanese. Not yet fruited here.
42	Hawkeye.....	Americana	1888										One of the best of this species.
43	Hungarian.....	Domestica	1888	10	May 8	Aug. 31	r	p	f	1	2	6-7	Identity yet rather uncertain.
44	Jewell.....	Americana	1890	5	" 12								Not valuable here.
45	Kelsey.....	Triflora	1890	8	" 19								Will not ripen here.
46	Kerr.....	Triflora	1897										Japanese. Not fruited here.
47	Kingston.....	Domestica	1890	10	May 7	Sept. 2	o	b	c	2	8	6	Very promising. Market.
48	Korai Quetsche.....	Domestica	1894	8-9									Hungarian. Not yet in fruit here.
49	Large Green.....	Domestica	1894	5	May 8	Aug. 21	r o	p	f	2	1	8	Not yet in fruit here.
50	Lincoln.....	Domestica	1890	7-8	" 8	" 31	r	p	c	1	10	5	So far lacks productiveness.
51	Lombard.....	Domestica	1890	8-9	" 7	" 2	r	p	c	1	1	5	Less valued than formerly.
52	Long Fruit.....	Triflora	1890	10	" 8	Sept. 7	r	g w	f	2	1	7-8	Identical with Yocco.
53	Lyon.....	Domestica	1890	9-10	" 8								Renamed thus by Mich. Hort. Society.
54	Mammoth Prune.....	Domestica	1895										Not yet fruited here.
55	Marianna.....	Cerasifera	1890	10	May 7	Aug. 21	o	r	c	f	1	6-7	Unproductive. Only valued for stocks.
56	Marshall.....	Domestica	1892										Not yet fruited here.
57	Maru.....	Triflora	1890	8	May 6	Aug. 27	r	r	c	1	10	5	Over productive. Needs thinning.
58	Maruka.....	Domestica	1898										Russian. Lacks productiveness.
59	McLaughlin.....	Domestica	1893	3-4	May 8	Sept. 23	r o	y	f	1	9	8	Not yet fruited.
60	Middleberg.....	Domestica	1890	8-9	" 8	Oct. 6							Late. Market.
61	Miner.....	Hortulana	1890	9	" 12								Not valuable here.
62	Mikado.....	Triflora	1897										Not fruited here.
63	Mistake.....	Domestica	1896	7-8	May 17								Not fruited. Name objectionable.
64	Moldavka.....	Domestica	1893	9	" 8	Sept. 6	o	y	f	3	1	6-7	Russian. Lacks productiveness.
65	Monarch.....	Domestica	1893	9	" 7	Aug. 27	o	p	c	2	4	7	Highly promising.
66	Moreman.....	Hortulana	1890	10	" 12	Aug. 6	ob	r	c	1	4	6	Among the finest of the species here.
67	Murdy.....	Domestica	1892	9	" 10	Sept. 23	r o	p	c	3	1	7-8	Not yet properly tested.
68	Muscot Fria.....	Domestica	1894	6-7									Hungarian. Not yet fruited.

1890	Newman	Angustifolia	8	"	18	Oct. 6						Lacks value here. Requires further trial.		
1891	Orchard	Domestica	9	"	10	Sept. 6						Not yet fruited here.		
1892	Oregon	Domestica	9-10	May	7	Aug. 3	r	y	f	1	10	Productive, showy, poor.		
1893	Orel, 20	Domestica	7-8	"	8	"						Not yet fruited.		
1894	Pottawattamie	Hortulana	10	"	10	"						Value here very doubtful.		
1895	Prarie Flower	Hortulana	5-6	"	12	"						Worthless here.		
1896	Red June	Triflora	10	"	6	Aug. 16	r	p	c	2	4	So far, the best of this species.		
1897	Red Nagate	Triflora	9-10	"	8	"	r	c	2	1	9	Only second to the foregoing.		
1898	Robinson.	Angustifolia	9-10	"	10	"	r	c	1	9	5	The most productive native here.		
1899	Saratoga	Domestica	10	"	8	"	r	c	2	1	6-7	Beautiful and good; market.		
1900	Salama	Triflora	10	"	8	"	r	p	c	2	2	Excellent; culinary variety.		
1901	Sargent Robe	Domestica	8-9	"	10	"	p	c	2	4	5	Not yet fruited here.		
1902	Shipper	Domestica	10	"	8	Aug. 30	o	b	c	2	10	Market only.		
1903	Shro Smomo.	Triflora	9	"	3	"	r	p	c	1	5-6	Too productive; must be thinned.		
1904	Shropshire	Domestica	10	"	8	Sept. 27	r	o	b	s	1	4	One of the numerous Damsons.	
1905	Silasy	Domestica	7	"	10	"						From Hungary; not fruited.		
1906	Simon	Domestica	8	Apr. 30	"	"	ob	y	r			Large, showy; scarcely eatable.		
1907	Simpson	Domestica	8	"	"	"						Not yet fruited here.		
1908	Spanish King	Domestica	9-10	May	8	Aug. 28	r	p	c	1	10	4-5	Promising; market.	
1909	Spaulding	Domestica	8-9	"	8	Sept. 6	o	y	c	1	1	8-9	Requires further trial.	
1910	Splendor	Domestica	8	"	17	"						Not yet fruited here.		
1911	Stark Gage	Domestica	10	"	13	"						Not yet fruited here.		
1912	Septos.	Domestica	10	"	15	"						A Pacific coast prune.		
1913	Sillasy Piro	Domestica										Imported from Hungary.		
1914	Throop	Domestica	10	May	17	Sept. 27	r	y	f	1	5	5-6	New; not yet fruited here.	
1915	Van Buren.	Americana	3-4	"	12	Aug. 21	o	r	f	2	3	6-7	Worthless here.	
1916	Victoria	Domestica	8-9	"	10	"						Promising for market.		
1917	Violeta	Domestica	3-4	"	7	"	o					Old; not yet fruited here.		
1918	Wales Prince.	Domestica	7-8	"	8	Sept. 9	o					Not yet fruited here.		
1919	Wangenheim	Domestica	10	"	10	Aug. 27	o	b	f	1	8	5	Productive; German.	
1920	Weaver	Americana	7-8	"	10	"						Not desirable here.		
1921	White Kelsey	Triflora	8-9	"	"	"						Not fruited here.		
1922	White Queen	Domestica	9-10	May	7	"	r					Not fruited here.		
1923	Wickson	Triflora	9-10	"	10	"						Very large; productive; good.		
1924	Willard	Triflora.	7-8	"	10	"						Not yet fruited here.		
1925	Wyant	Americana	8	"	12	Sept. 28	r	o	y	f	1	3	7-8	Better farther west.
1926	Yellow Anbert.	Domestica	9-10	"	8	"	o	y	c	2	1	4	7	A Russian importation; promising.
1927	Yellow Egg	Domestica	10	"	8	"	r	c	2	1	1	4	5	Old very large; market.
1928	Yosbe.	Triflora	10	"	7	July 24	r	y	f	1	1	2-3		Small; the earliest plum.
1929	Yosemite	Domestica	5	"	10	Sept. 30	y							Not desirable here.
1930	Younken Golden.	Domestica	7	"	"	"								Not yet fruited here.

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PRUNUS.—*Americana*.

This species has heretofore been understood to include the entire group of wild, native varieties, except those classed as *chicasa*, but the more recent introduction of many such varieties to cultivation has betrayed such wide differences of important characteristics that the process of segregation is in progress, though perhaps not yet complete.

Of those tested here, grouped as *angustifolia*:

Newman is but partially tested, and must be regarded as of doubtful value.

Robinson is one of the most profitable of the *Americanas*, though by no means comparable with many of the *domesticas* for localities, in which the latter are successful.

Of those designated as *cerasifera*:

Marianna, only, is under trial here. So far it is a vigorous grower, but exceedingly unproductive. Here it does not propagate readily from cuttings, as is said to be the case farther south.

Of those grouped as *hortulana*:

Moreman is beautiful and of good quality. Here it is the best of this group, though none of them are valuable.

PRUNUS.—*Domestica*.

This is the species heretofore chiefly grown in Michigan. It includes European varieties, together with seedlings of this type originating in America. Of these Bavay, Black Diamond, Bradshaw, Shipper and Yellow Egg have been long and thoroughly tested, and may safely be extensively planted for commercial purposes.

The following, though less thoroughly tested, may be regarded as worthy of extensive trial for the same purpose, viz: Arch Duke, Field, Grand Duke, Kingston, Middleburg, Monarch, Murdy, Saratoga, Spanish King, Victoria and Yellow Aubert.

Bavay, Coe, Columbia, Lincoln and McLaughlin are varieties well adapted to planting in the home plat.

Nearly thirty of the tabulated varieties of this species have either not yet fruited, or have borne too lightly to suffice for adequate description.

PRUNUS.—*Simoni*.

The form known as Simon or Apricot plum is large and showy. It is said, farther south, to be of tolerable quality, but here its quality is so low as to render it worthless, save, perhaps for exhibition purposes.

PRUNUS.—*Triflora*.

The above seems now to be generally recognized as the appropriate and preferred specific name of the group known as Japanese plums, which were, for a time, designated as *hattan*.

Abundance is a name applied to what was previously known as Botan, a name which, according to the rules of pomology, is entitled to precedence.

Burbank, and yet more recently, Red June, are largely superseding the Botan in popularity. Red June seems likely to win precedence on account of its slightly improved quality, large size, and especially the more satisfactory habit of the tree, which is upright, while Burbank is spreading and almost drooping.

Kelsey fails to mature its wood within our season. It is only adapted to the climate of California and the extreme south.

Long Fruit and Yosebe, as received from Georgia, are obviously identical. The fruit is very small and of indifferent flavor, usually ripening about the middle of July.

Maru and Shiro Smomo in form and color are much like Botan, though of smaller size and earlier. They are excessive bearers.

Ogon is of good size and bears moderately, but the fruit, though beautiful, is sadly deficient in quality.

Red Nagate, as received from Georgia, is much like Red June, though somewhat less in size and otherwise distinct.

Satsuma, owing to its color, is frequently gathered before full maturity. Here it is sufficiently productive, and when fully matured is one of the best of the species for culinary purposes. Trees received here as Chabot have now fruited and prove identical with the above.

Trees received as Gold, Hale, Kerr, Mikado and Willard have not yet fruited.

Wickson showed more or less bloom last spring, but failed to fruit this year, though maturing a few fine specimens last year upon year old grafts.

#### PEARS.—*Pyrus communis*.

The cold, backward spring of 1897 held pears, in common with other fruit trees, in a dormant condition much later than usual, and while in this condition they, in common with other trees, received a thorough spraying, the needful pruning having been done during mild weather in early March.

June 1st and 2d gave pears a spray of Bordeaux, adding three ounces of Paris green to each barrel of water, as a preventive of scab and codling moth.

June 18th sprayed pears with copper sulphate (one pound in 50 gallons of water) to prevent scab, adding three ounces of Paris green for codling moth.

July 6th repeated the foregoing for the same purpose.

July 26th, drouth being very severe, several young pear trees, which had become seriously enfeebled, were treated with two quarts of bone meal, one quart of nitrate of soda and one peck of ashes. The whole was well mixed with the soil about the trees which were then thoroughly watered.

Crimson clover was sowed among pears on August 2d and 3d after a moderate shower. This started promptly, but the immediate occurrence of hot, drying weather ruined much of it, except where more or less shaded. The stand of plants is therefore more or less imperfect.

August 14th the slug having attacked the foliage of a few pear trees; they were dusted with air-slaked lime.

Several pear trees were at different times attacked by blight, which was promptly cut away and burned. Only in one or two cases has it become necessary to wholly remove the trees.

TABULATION OF PEARS—*Pyrus Communis*—1897.

Abbreviations.—Season, months—b, beginning; e, end; m, middle. Form—i, irregular; o, oblate; ob, oblong; obo, obovate; obt, obtuse; ov, ovate; p, pyriform; r, round; t, turbinate. Color—b, brown; c, crimson; g, greenish; r, red; ru, russet; w, whitish; y, yellow. Texture—b, buttery; f, firm; g, granular; m, maling; t, tender. Flavor—s, acid; as, astringent; j, juicy; s, sweet; v, vinous; p, perfumed. Use—d, dessert; k, kitchen; m, market.

Number.	Names.	Planted.	Bloomed.	Season.	Vigor— Scale 1-10.	Origin.	Ones— Weight.	Form.	Color.	Texture.	Flavor.	Quality— Scale 1-10.	Use.
									Skin.	Flesh.			
1	Alphard.....	1892	May 8	Oct.....	9	France.....	12	ob obo	y ru	w	j v	5-6	m
2	Angouleme.....	1891	" 8	e Oct.....	9	France.....	12	ob p	y ru	w	j v p	5-6	d m
3	Anjou.....	1893	" 8	e Oct.....	8-9	France.....	10	ob p	y ru	w	j v p	5-6	m
4	Anjou.....	1893	" 12	e Sept.....	5-6	France.....	6	obo obt p	y ru	w	j v p	5-6	m
5	Ayer.....	1896											
6	Barry.....	1892	May 15	Dec.....	8	California.....	6	obo obt p	y ru	w	j v	5-6	d m
7	Bartlett.....	1891	" 10	m Sept.....	8	England.....	7	obo obt p	y ru	w	j v	5-6	d m
8	Bartlett Seckel.....	1894			5	America.....							
9	Bandy.....	1896			7	Texas.....							
10	Beauty Sum.....	1895			10								
11	Bloodgood.....	1898	May 8	m Aug.....	9-10	New York.....	4	t obo	y ru	y w	s p	5-6	p
12	Bordeaux.....	1892			10	France.....							
13	Bosc.....	1898	May 12	e Oct.....	7-8	Belgium.....	10	pi	y ru	w	j v p	5-6	d m
14	Boussock.....	1891	" 12	e Oct.....	9	Belgium.....	8	r obo	y ru	w	j v p	5-6	m
15	Brandywine.....	1898			10	Delaware.....							
16	Buffum.....	1891	May 17	m Oct.....	10	Rhode Island.....	6	obt obo	y ru	w	j s	5-6	m
17	Clairgean.....	1891	" 10	e Sept.....	6-7	France.....	6	pi	y ru	y	s p v	5-6	d m
18	Clapp Favorite.....	1898	" 12	b Sept.....	10	Massachusetts.....	9	t	y ru	w	s v	6-7	d m
19	Col. Fager.....	1896			6-7	California.....							
20	Comice.....	1891	May 8	m e Oct.....	9	France.....		r obt p	s b	w	j s p	8-9	d m
21	Congress.....	1890	" 12	e Sept.....	10	France.....	12	r obt p	y ru	w	j p	5-6	d m
22	Dana Hovey.....	1898	" 13	Oct. Nov.....	9-10	Massachusetts.....	4	obo obt p	y ru	y	j s p	10	d
23	Darborn.....	1891	" 13	b Sept.....	10	Massachusetts.....	2	r p	y ru	w	j s	8-9	d
24	Desportes.....	1891			24	France.....	5	obo obt p	y ru	y w	j s		
25	Dorset.....	1895			9								
26	Drouard.....	1890											
27	Dubamel.....	1891	May 8	m Oct.....	10	France.....	4	obo obt p	y ru	w	j s	7-8	d
28	Early Duchesse.....	1892	" 14	b Oct.....	7	France.....	5	obo obt p	y ru	w	j s	6-7	m
29	Edmonds.....	1899	" 17	Oct.....	8	New York.....	7	obo obt p	y ru	w	j s	5-6	m
30	Elizabeth Manning.....	1891	" 8	e Aug.....	10	Belgium.....	3	r obo	y ru	w	j s p	8-9	m
31	Espereau.....	1891	May 8	m Oct.....	10	Belgium.....	5	r obt p	y ru	w	j s	4-5	d
32	Fitzwater.....	1891	" 10	b Oct.....	7	New York.....	4	obo obt p	y ru	w	j s	8-9	d
33	Flemish.....	1891	" 17		10	Belgium.....	5	obo obt p	y ru	w	j s	5-6	m
34	Fox H. S.....	1892			6-7	California.....							
35	Fred Clapp.....	1898	May 13		9-10	Massachusetts.....							

36	Gakovik	1888	"	8.	m Aug.	5	Russia	3	p	gy	b	v	4	m
37	Ganel Seikel	1882				9	England							
38	Gatet	1884				10	America							
39	Giffard	1888	May 8		m Aug.	4	France	4	p	yru	m	v	9-10	d
40	Gray Doyenne	1888	" 8		b Oct.	5	France?		ov obo	oru	b m	v	8-9	d
41	Graveland	1880				5-6	Alabama							
42	Grunkower	1891				7-8	Europe							
43	Hardy	1888				10	Illinois?							
44	Henry	1894				8-9	Belgium							
45	Heyst Emilie	1893				9	Massachusetts							
46	Hood	1888	May 10		m e Sept	8	Connecticut	8	r p	yru	m	v j	5-6	m
47	Howell	1883				8	Idaho							
48	Idaho	1883	May 15		Oct	3	Pennsylvania	3	obo p	yru	g b	sv	5-6	d
49	Jones	1839	" 10		m Oct.	7	Pennsylvania	7	r ov obt	yru	b m g	s	8-9	d
50	Josephine	1880				10	Pennsylvania	6	r obt p	yru	m g	v	4-5	m
51	Keiffer	1891	" 4		e Oct.	10	Illinois							
52	Kuonce	1885				8	Kentucky?							
53	Kentucky	1891				10	New York							
54	Kraus 18	1886				8	New York							
55	Kraus 41	1895				8	Ohio?							
56	Lady Clapp	1885				5	Massachusetts							
57	Lawrence	1888	May 12		Nov., Dec	7-8	New York	5	obo obt p	yru	m	s j p	8-9	d m
58	Lawson	1889	" 10		m Aug.	8-9	America	5	obo p	yr	b	s	3-4	m
59	Lincoln	1884				10	Ohio?							
60	Longworth	1891					France							
61	Louise Jersey	1891	May 12		m e Sept.	8	Europe	6	obo p	yru	m	j s	8-9	d m
62	Lucrative	1888	" 13			8	Ohio							
63	Luce Duke	1892	" 10		e Aug	8-9	France	4	obo	y g	t b	j v s	8	d
64	Margaret	1890	" 10		b Aug.	8-9	France	2	o obt p	g y b	b m	j s p	5-6	d
65	Marguerite Petite	1888					New York							
66	Marshall	1893				9-10	Belgium							
67	Mas Frie	1898					Pennsylvania							
68	Milford	1898				8-9	Europe	7	r obo	yru	f	v	5-6	k m
69	Milford Grad.	1891	May 8		Nov., Jan.	9	Massachusetts	6	r obt p	yru	g m	v j p	5-6	k m
70	Mount Vernon	1888	" 8		Nov.	9	Massachusetts	9	ob obt p	yr	b	j v	6-7	m
71	Ogerson	1891	" 8		m Oct.	9	France	6	ov obo obt p	yru	g b	v j	7	m
72	Oliver	1888	May 12		e Sept	10	New York	17	ob obo p	yru	m b	v j	7-8	m
73	Onondaga	1891	" 8			9	New York	8	r ov obt p	yru	m b g	j s v	8-9	d m
74	Orland	1891	May 12		e Oct.	10	Europe	3	obo p	yru	m b	s p	10	d
75	Piscaton	1891	" 8		m Oct.	9	America?	9	r p	yru	f g m	s v p	7	m
76	Reeder	1890	May 11		e Aug	8-9	Pennsylvania	3	obo	yru	b m		10	d
77	Reliance	1888	" 8		b Oct.	8-9	Pennsylvania	3	obo	g b ru			10	d
78	Rentner	1889	" 12		b m Oct.	8-9	Pennsylvania	3	obo				10	d
79	Rittel	1882												
80	Seckel	1888												

TABULATION OF PEARS, 1887.—Concluded.

Number.	Names.	Planted.	Bloomed.	Season.	Vigor— Scale 1-10.	Origin.	Ounces— Weight.	Form.	Color.		Texture.	Flavor.	Quality— Scale 1-10.	Use.
81	Seneca.....	1884	May 10	m e Oct.	8	New York?	4	r obo	yrn	w	m	j v p	7-8	m
82	Sheldon.....	1880	" 8	e Aug.	10	" "	9	r o v	yrn	w	m	j s	5-6	m
83	Sterling.....	1888			10	America?								
84	Stout.....	1888												
85	Sudduth.....	1886	May 12	b Aug.	5	Illinois	2	r obo p	yr	w	m	j s	4-5	p
86	Summer Doyenne.....	1888			8-9	Belgium								
87	Superfin.....	1891			10	France								
88	Tyson.....	1888			10	Pennsylvania								
89	Vas (ott.....	1883			5	Vermont								
90	Vermont.....	1884			8									
91	Vicar.....	1891			10	France								
92	Victor.....	1891	May 17		10									
93	Wilder Early.....	1889	" 15	Nov., Dec.	8	New York	4	r obo	yrn	yw	bm	j v p	10	dm
94	Winter Nellie.....	1888	" 13		7-8	Belgium								
95	Worsten Seckel.....	1886			5	America?								
96	Zache.....	1884	May 12	e Oct.	10	" ?	10	r o	y	w	s	s	2-3	p

The following varieties are named, as nearly as practicable, in the order of their ripening. The list includes the *cream* of those fruited here and known to be generally successful in this state, and well worthy of a place in the home plantation, viz: Summer Doyenne, end of July; Bloodgood, b August; Giffard, m August; Margaret, e August; Rostiezer, b September; Clapp *Fav.*, b m September; Lucrative, e September; Elizabeth *Manning*, September; Seckel, October; Bosc, October; Comice, October, November; Anjou, October, November; Dana Hovey, November, January.

The following can be relied on to supply a market with a succession of varieties of fair quality and attractive appearance during the usual season, viz: Clapp *Fav.*, b m September; Bartlett, m e September; Boussock, September, October; Howell, September, October; Angouleme, October; Bosc, October; Sheldon, October; Anjou, October, November; Ogereau, October, November; Rutter, October, November; Reeder, November; Clairgeau, October, December; Mount Vernon, November, December; Lawrence, December; Winter Nelis, December, January.

Ansault (Bonne du Puits Ansault) is a fine pear of medium size and quality. Is, so far, a profuse and constant bearer, and must be severely thinned to maintain the health and vigor of the tree. Promising for market.

Coreless. Trees received from a Missouri nursery, under this name, bore a fine crop of fruit last year and proves to be identical with Flemish.

Bessemianka, Gakovsk, Kurskaya and Victorina are Russian varieties of low quality and valueless here.

Congres (Souvenir du Congres), though of only medium quality, is very large and beautiful under favorable conditions, but severe pruning and thinning, together with intensive culture will be found indispensable to the realizing of such result.

Trees of Fitzwater pear, planted in 1891, made fairly vigorous, healthy growths for several years, but from some unknown cause they have made but feeble growth during the last two years. Copious watering during drouth, together with the application of special fertilizers, have been resorted to with apparently promising effect.

Lawson, popular for a time in eastern New York as a market variety, has fruited here this year. Its fine size and beautiful color are its chief merits.

Onondaga ripens after the plethora of autumn fruits is past, and deserves a place in both the home and the commercial plantation as a fair dessert pear, and especially as a culinary variety.

Wilder Early, which has received high praise in certain localities, proves here to be a tardy bearer. It bloomed for the first time last spring, but failed to mature fruit.

Winter Nelis must have rich soil, and should not be allowed to overbear if its usual high quality is to be maintained.

Barry, *P. Barry*, is a comparatively recent California seedling, and an unusually long keeper. It promises unusually well as a late winter pear of high quality, but will probably require to be ripened in a warm room with special care to avoid shriveling. The tree is a straggling grower.

*Pyrus sinensis.*

There are but one or two varieties of this species on trial here, and these have been included in the foregoing list, rather than tabulate them separately.

Zache possesses the long slender stem, the oblate form, and the firm, coarse, granular flesh which usually characterize this species, and for that reason is assumed to be of pure *sinensis* parentage. It will be desirable, if at all, for culinary uses. Like certain others of the species, the very large, rich, glossy foliage, may even render it desirable as an ornamental tree.

Keiffer possesses peculiarities of both tree and fruit, which indicate a probable hybridization, with *sinensis* as one of the parents. If valuable at all in Michigan it is for strictly commercial purposes, upon quick, warm soils and to catch the trade of those who are won by looks rather than quality. Farther south, with longer seasons, it is improved in beauty, size and perhaps even in quality.

APPLES.—*Pyrus.*

The pruning of apples was commenced on March 29, and completed on or about April 3.

On June 2 apples (and pears also) were sprayed for scab and codling moth, using Bordeaux of ordinary strength, with three ounces of Paris green in each 40 gallons of the mixture. The spray with this mixture was repeated on June 18 for the same purpose, and was again applied on July 6 to 8.

The green aphid has been but slightly troublesome upon the apple, though a few were discovered, mostly upon small trees. These were effectively treated with tobacco decoction on June 18.

On September 25 Woolly Aphid, *Schizoneura lanigera* (Hausm), having appeared upon a few twigs of apple, a decoction of tobacco stems was applied, and this not proving fully effective they were again sprayed, this time effectively, with kerosene emulsion.

The three sprayings, though apparently effective against scab, appeared to be less so as a preventive of codling moth, a large percentage of the fruit betraying the presence of the larvae—a result perhaps due to tardy or inefficient spraying, or perchance to the adulteration of the poison used.

No insect depredations have been observed, aside from those noted in connection with spraying.

There are at present two hundred and ninety-five varieties of apples on trial upon the station grounds, of which nineteen are either crabs or supposed hybrids and are tabulated separately. Of the remainder, one hundred and thirty-five have bloomed or fruited during the current year, while one hundred and forty-one have not yet shown bloom, and are not included in the tabulation.

In grading for quality, upon the scale 1 to 10, varieties are compared with those of the same species only.

TABULATION OF APPLES—*Pyrus*—1897.

Crabs—P—bacata; including actual and supposed hybrids.

Abbreviations—Month: b, beginning; e, end; m, middle. Form: c, conical; f, irregular; o, oblate; ob, oblong; ov, ovate; r, roundish. Color: g, green; r, red; m, russet; a, striped; w, white; y, yellow. Texture: e, crisp; d, dry; f, firm; j, juicy; t, tender. Flavor: a, acid; m, mild; s, sweet. Use: e, elder; d, dessert; k, kitchen; m, market.

No.	Names.	Origin.	Planted.	Bloomed.	Ripe.	Season.	Weight, ounces.	Form.	Color.	Texture.	Flavor.	Quality— Scale 1 to 10.	Use.
1	August	Minnesota	1890	May 12	Aug. 27	e Aug. b Sept.	3	r o	Yrs H pl	of	a	3-4	k
2	Dediet	Illinois	1894	June 5									
3	Darmonth	Massachusetts	1890	May 12	e Aug.	e Aug. b Sept.	2	o	r	cj	m	10	k d
4	Excelsior	Minnesota	1890	" 12	e Aug.	b Sept.	4	r o	Yrs	tj	a	6-7	k m
5	Florence	Minnesota	1890	" 12	e Aug.	b Sept.	2	o	Yrs	tj	a	6-7	k m
6	Gibb	Wisconsin	1890	" 15	e Aug.	b Sept.	2	o o	Yrs	cj	m a	7-8	d k m
7	Gracie	Minnesota	1890	" 15	e Sept.	b Oct.	2	o b c	Yrs	o	a	5-6	k
8	Jelly	Minnesota	1890	" 14	m. Sept.	e Sept.	3	r o v	Yrs	tj	m	5-6	k m
9	Jon	Minnesota	1890	" 17	b. Sept.	Sept., Oct.	3	o	Yrs	cj	m	9-10	k m
10	Martha	Minnesota	1890	" 13	m. Aug.	Aug.	2	r o	Yrs	o	a	6	k
11	North Star	Minnesota	1891	" 13	m. Aug.	Aug.	2	r o	Yrs	o	a	6	k
12	No. 2 New	Minnesota	1890	May 12	e Aug.	Sept.	5	o c	Yg	o	m	6	k m
13	No. 2 New	Minnesota	1890	" 13	e Aug.	Sept.	5	r	Yrs	o	a	6	k m
14	October	Minnesota	1890	" 13	b Sept.	Sept.	6	r o	r	fj	m	6-7	k m
15	Peter	Minnesota	1890	" 19	b Sept.	Sept.	6	r o	r	fj	m	6-7	k m
16	Quaker	Minnesota	1891	" 14	m e Oct.	Oct., Jan.	2	r o v	Yrs	o	m s	6-7	k m
17	Transcendent	Minnesota	1893	" 13	b Sept.	Sept.	3	r	Yrs	o	a	5-6	k m
18	Virginia	Illinois	1894	" 13	b Sept.	Sept.	3	r	Yrs	o	a	5-6	k m
19	Whitney, 20	Illinois	1890	May 12	e Aug.	Sept.	4	o v o	ry	tj	m	8-9	d m



TABULATION OF APPLES—*Pyrus*—1897.—Continued.P. *Malus*.

Abbreviations—Months: b, beginning; e, end; m, middle. Form: c, conical; i, irregular; o, oblate; ob, oblong; ov, ovate; r, roundish. Color: g, green; r, red; ru, russet; a, striped; w, white; y, yellow. Texture: c, crisp; d, dry; f, firm; j, juicy; t, tender. Flavor: a, acid; m, mild; s, sweet. Use: c, cider; d, dessert; k, kitchen; m, market.

No.	Names.	Origin.	Planted.	Bloomed.	Ripe.	Season.	Weight in ounces.	Form.	Color.	Texture.	Flavor.	Quality—Scale 1 to 10.	Use.
1	American Blush.	America	1890	May 19									
2	Arnold	Ontario	1890	" 19									
3	Rabbit	America ?	1890	" 15									
4	Bally Sweet	New York ?	1898	" 15	Oct.	Nov.-Mar.	9	r	r	t	s	8-9	d k m
5	Batullen	Russia	1898	" 21									
6	Bietzheimer	Germany	1890	" 15									
7	Blus Anis	Russia	1890	" 17	e Aug.	Sept.	6	ro	yr s	c i t	a	5-6	k m
8	Borovinka	Russia	1898	" 13	Oct.	Jan.-Feb.	6	o o	yr	t	s	5-6	d k
9	Bottle Greening	Vermont	1890	" 12	Oct.	Sept.	6	ro	y	t j	s	6-7	d k
10	Bough	America	1898	" 13	e Aug.								
11	Bradford	Tennessee ?	1890	" 15	Oct.	Dec.-Mar.	5	ro v	gr s	t j	m	4	m
12	Buckingham	America ?	1892	" 19									
13	Canada Baldwin	Quebec	1890	" 18									
14	Carrough	America ?	1890	" 18									
15	Chenango	New York	1898	" 19	e Aug.	Sept.	6	o b o	yr s	t j	m	5-6	d m
16	Clark Orange	America ?	1892	" 19	b Oct.	Nov.	6	ro i	yr s	t o	m	5	d m
17	Cornwell	Connecticut	1898	" 18	Oct.	Dec.-Mar.	8	ro o	yr s	t j	m	5	d m
18	Colton	Ohio ?	1898	" 12	m Aug.	Sept.	6	o v o	g y	t	m	6	d m
19	Colvert	America ?	1892	" 17									
20	Cornell	Pennsylvania	1890	" 19									
21	Crane	Illinois	1898	" 19									
22	Callin	America ?	1890	" 19									
23	Day	Nebraska	1891	" 17	m Oct.	Nov.-Dec.	7	ro	yr s	t	m	3-4	m
24	Dearie	Quebec	1890	" 18									
25	Dickinson	America ?	1899	" 21									
26	Dyer	France ?	1898	" 14	m Sept.	Sept.-Oct.	7	ro	yr	t j	a m	7-8	d k
27	Early Ripe	Pennsylvania	1891	" 18									
28	Early Strawberry	New York	1898	" 18									
29	Egyptian	Kentucky ?	1898	" 19									
30	Evans	Idaho	1898	" 22									
31	Fall Pippin	America ?	1898	" 28									
32	Family Favorite	America ?	1891	" 18									

28	Flak	Ohio	1892	" 19	m Oct.	Nov.-Mar.	11	o	y r	o t j	m	5	m
29	Flak	Ohio	1892	" 19	m Sept.	Sept.-Oct.	4	r o o	g y r s	t j	m	10	d
30	Flak	New York	1890	" 19	Sept.	Sept.-Dec.	6	ob ov	y r u	o	m	4	m
31	Flak	Missouri	1890	" 19	Oct.	Oct.-Nov.	5	o o	r y s	o	m	45	m
32	Flak	Massachusetts	1890	" 19	Nov.	Dec.-Apr.	6	r o	y r u	f j	m	7-8	d m
33	Gavel	Nova Scotia	1895	" 19	Oct.	Dec.-Mar.	6	r o b	y	o t j	m	8-9	d m
34	Gavel	Minnesota	1890	" 18	m Sept.	Sept.-Oct.	7	r o	g y r s	t j	a	78	k m
35	Globe	Wisconsin	1893	" 17	Oct.	Oct.-Nov.	6	o o	r y s	o	m	45	m
36	Globe	Russia	1893	" 15	Nov.	Dec.-Apr.	6	r o	y r u	f j	m	7-8	d m
37	Golden Rainette	England	1893	" 17	Oct.	Dec.-Mar.	6	r o b	y	o t j	m	8-9	d m
38	Golden Rainette	England	1893	" 17	m Sept.	Sept.-Oct.	7	r o	g y r s	t j	a	78	k m
39	Grimes	Virginia	1890	" 18	Oct.	Dec.-Mar.	6	r o b	y	o t j	m	8-9	d m
40	Grosh	Pennsylvania	1890	" 17	m Sept.	Sept.-Oct.	7	r o	g y r s	t j	a	78	k m
41	Hass	Missouri	1892	" 21	Oct.	Oct.-Nov.	5	o o	r y s	o	m	45	m
42	Hass	Europe	1892	" 21	Nov.	Dec.-Apr.	6	r o	y r u	f j	m	7-8	d m
43	Hass	Europe	1892	" 21	Oct.	Dec.-Mar.	6	r o b	y	o t j	m	8-9	d m
44	Hass	Europe	1892	" 21	m Sept.	Sept.-Oct.	7	r o	g y r s	t j	a	78	k m
45	Hass	Europe	1892	" 21	Oct.	Dec.-Mar.	6	r o b	y	o t j	m	8-9	d m
46	Hass	Europe	1892	" 21	m Sept.	Sept.-Oct.	7	r o	g y r s	t j	a	78	k m
47	Hass	Europe	1892	" 21	Oct.	Dec.-Mar.	6	r o b	y	o t j	m	8-9	d m
48	Hass	Europe	1892	" 21	m Sept.	Sept.-Oct.	7	r o	g y r s	t j	a	78	k m
49	Hass	Europe	1892	" 21	Oct.	Dec.-Mar.	6	r o b	y	o t j	m	8-9	d m
50	Hass	Europe	1892	" 21	m Sept.	Sept.-Oct.	7	r o	g y r s	t j	a	78	k m
51	Hass	Europe	1892	" 21	Oct.	Dec.-Mar.	6	r o b	y	o t j	m	8-9	d m
52	Hass	Europe	1892	" 21	m Sept.	Sept.-Oct.	7	r o	g y r s	t j	a	78	k m
53	Hass	Europe	1892	" 21	Oct.	Dec.-Mar.	6	r o b	y	o t j	m	8-9	d m
54	Hass	Europe	1892	" 21	m Sept.	Sept.-Oct.	7	r o	g y r s	t j	a	78	k m
55	Hass	Europe	1892	" 21	Oct.	Dec.-Mar.	6	r o b	y	o t j	m	8-9	d m
56	Hass	Europe	1892	" 21	m Sept.	Sept.-Oct.	7	r o	g y r s	t j	a	78	k m
57	Hass	Europe	1892	" 21	Oct.	Dec.-Mar.	6	r o b	y	o t j	m	8-9	d m
58	Hass	Europe	1892	" 21	m Sept.	Sept.-Oct.	7	r o	g y r s	t j	a	78	k m
59	Hass	Europe	1892	" 21	Oct.	Dec.-Mar.	6	r o b	y	o t j	m	8-9	d m
60	Hass	Europe	1892	" 21	m Sept.	Sept.-Oct.	7	r o	g y r s	t j	a	78	k m
61	Hass	Europe	1892	" 21	Oct.	Dec.-Mar.	6	r o b	y	o t j	m	8-9	d m
62	Hass	Europe	1892	" 21	m Sept.	Sept.-Oct.	7	r o	g y r s	t j	a	78	k m
63	Hass	Europe	1892	" 21	Oct.	Dec.-Mar.	6	r o b	y	o t j	m	8-9	d m
64	Hass	Europe	1892	" 21	m Sept.	Sept.-Oct.	7	r o	g y r s	t j	a	78	k m
65	Hass	Europe	1892	" 21	Oct.	Dec.-Mar.	6	r o b	y	o t j	m	8-9	d m
66	Hass	Europe	1892	" 21	m Sept.	Sept.-Oct.	7	r o	g y r s	t j	a	78	k m
67	Hass	Europe	1892	" 21	Oct.	Dec.-Mar.	6	r o b	y	o t j	m	8-9	d m
68	Hass	Europe	1892	" 21	m Sept.	Sept.-Oct.	7	r o	g y r s	t j	a	78	k m
69	Hass	Europe	1892	" 21	Oct.	Dec.-Mar.	6	r o b	y	o t j	m	8-9	d m
70	Hass	Europe	1892	" 21	m Sept.	Sept.-Oct.	7	r o	g y r s	t j	a	78	k m
71	Hass	Europe	1892	" 21	Oct.	Dec.-Mar.	6	r o b	y	o t j	m	8-9	d m
72	Hass	Europe	1892	" 21	m Sept.	Sept.-Oct.	7	r o	g y r s	t j	a	78	k m
73	Hass	Europe	1892	" 21	Oct.	Dec.-Mar.	6	r o b	y	o t j	m	8-9	d m
74	Hass	Europe	1892	" 21	m Sept.	Sept.-Oct.	7	r o	g y r s	t j	a	78	k m
75	Hass	Europe	1892	" 21	Oct.	Dec.-Mar.	6	r o b	y	o t j	m	8-9	d m
76	Hass	Europe	1892	" 21	m Sept.	Sept.-Oct.	7	r o	g y r s	t j	a	78	k m
77	Hass	Europe	1892	" 21	Oct.	Dec.-Mar.	6	r o b	y	o t j	m	8-9	d m
78	Hass	Europe	1892	" 21	m Sept.	Sept.-Oct.	7	r o	g y r s	t j	a	78	k m

TABULATION OF APPLES—*Pyrus*—1891.—Concluded.  
P. *Malus*.

No.	Names.	Origin.	Planted.	Bloomed.	Ripe.	Season.	Weight in ounces.	Form.	Color.	Texture.	Flavor.	Quality—Scale 1 to 10.	Use.
79	Nyack	America?	1890	May 21	Oct.	Nov.-Mar.	8	o	ys	tj	m	7.8	d m
80	Oakland	Michigan?	1888	" 13	m Aug.	Sept.	8	o	ys	otj	m	4.5	k m
81	Odenburg	Russia	1890	" 17	Oct.	Jan.-April.	10	o	ys	cfj	m	6.7	d k m
82	Ontario	Ontario	1890	" 21	Oct.								
83	Pawpaw	Michigan.	1888	" 21									
84	Peck	Rhode Island?	1888	" 18									
85	Pewaukee	Wisconsin	1892	" 19									
86	Pickens	Kentucky	1888	" 18	Oct.	Dec.	6	r o c	ys	tj	m	4.5	m
87	Pine Stump	Georgia?	1892	" 15									
88	Primate	America	1888	" 13	m Aug.	Aug.-Sept.	7	r o	yr	tj	m	9	d k
89	Prolific Sweet	Connecticut	1890	" 18									
90	Prior Red Seedling	Illinois?	1888	" 18									
91	Pyrus Malus fl. pl.	America?	1892	" 12									
92	Quince Cole.	America	1892	" 19	e Aug.	Sept.	6	r o	y	ot	a	4.5	k m
93	Rambo	Pennsylvania	1888	" 18									
94	Ramsdell Sweet	America	1890	" 15	Oct.	Oct.-Feb.	7	ob c	r	t	a	4.5	k m
95	Red Abate	Russia	1888	" 18	b m Sept.	Sept.-Oct.	10	o c	ys	tj	m	5.6	k m
96	Red Astrachan	Russia	1893	" 13	m Aug.	Jan.-May.	8	r o c	yr	tj	m	8.9	d m
97	Red Canada	New England?	1893	" 19	Oct.		6	o c	yr	fj	m		
98	Red Dettmer	Russia.	1888	" 17									
99	Red June	Carolina?	1892	" 16	m Aug.	Aug.	3	ov c	r	tj	m	7.8	d
100	Red McMahon	America	1894	" 16	Aug.								
101	Red Russet	N Hampshire.	1890	" 19									
102	Rhode Island	Rhode Island?	1893	" 15	Oct.	Dec.-Mar.							
103	Ribston	England	1893	" 19									
104	Ronk	Indiana	1893	" 18	Oct.	Oct.-Dec.	9	r o c	ys	f	a	5.6	k m
105	Rosenhager	Europe	1888	" 13	Oct.	Jan.-June	6	r o	yr	fj	m	7.8	k m
106	Roxbury	Massachusetts	1893	" 19									
107	Saloma	Illinois	1893	" 19									
108	Scarlet Cranberry	America	1891	" 18									
109	Scott Winter	Vermont?	1892	" 18	Oct.	Oct.-March	6	r o b o	grs	t	m	7	m
110	Sherrif	Pennsylvania	1891	" 17									
111	Smokehouse	Pennsylvania	1893	" 18									
112	Sonnet New York	New York	1892	" 18	e Aug.	Sept.	6	c	yr	fj	a	8	d k
113	Spencer	America	1891	" 18									

114	Stark	Ohio?	1888	May 17	Oct.	Dec.-Apr.	8	robo	gyrs	f <sub>o</sub>	m	45	m
115	St. Lawrence	America?	1888	" 19	e Sept.	Oct.	9	oo	yrs	fj	m	5-6	d m
116	Seward?	America?	1890	" 18	"	"	"	"	"	"	"	"	"
117	Stump	New York	1899	" 14	"	"	"	"	"	"	"	"	"
118	Summer Livland	Russia	1890	" 19	m Sept.	"	"	"	"	"	"	"	"
119	Summer Pearmala	America?	1888	" 18	b m Sept.	Sept.	5	oo	r r	tj	m	10	d
120	Summer Rose	America?	1892	" 17	m e Aug.	Aug.	3	o	yrs	tj	m	8	d
121	Thaler?	Russia	1898	" 15	b Sept.	Sept.	4	ob	yrs	fj	m	5	k
122	Thornton	America?	1893	" 18	Oct.	Nov.	6	rov	gyrs	oj	m	6	m
123	Titovka	Russia	1898	" 13	m Aug.	Sept.	8	ool	yrs	"	m	5-6	k m
124	Tolman	Rhode Island	1898	" 17	Oct.	Dec.-Mar.	6	ro	yr	f	s	8	k m
125	Townsend	Pennsylvania	1890	" 21	"	"	"	"	"	"	"	"	"
126	Wagner	New York	1893	" 13	Oct.	Dec.-Mar.	7	oo	yrs	tj	ma	7-8	do
127	Washington Str.	New York	1890	" 13	b Sept.	Sept.	"	"	"	"	"	"	"
128	Water	Pennsylvania	1890	" 17	Oct.	Oct.-Nov.	5	rovc	yr	tj	m	5	d m
129	Wealthy	Minnesota	1890	" 18	m Sept.	Oct.	8	ro	yr	tj	m	6	d m
130	Whinner?	America?	1890	" 12	"	"	"	"	"	"	"	"	"
131	Winter Streifling	Russia	1898	" 16	m e Sept.	Sept.-Oct.	8	ro	yrs	tj	m	4-5	k m
132	Yellow Transparent	Russia	1898	" 18	m Aug.	Aug.	5	ovo	y	oj	a	3-4	k m
133	York Imperial	Pennsylvania	1892	" 19	e Aug.	Sept.	10	r	yrs	fo	a	3-4	k m
134	Zolotareff	Russia	1840	" 17	m Sept.	"	"	ro	yr	to	a	3-4	k m
135	Zozoff	Russia	1890	" 13	"	"	"	"	"	"	"	"	"

\* m Aug.-m Sept.

## CRABS.

August, Excelsior, Florence, Gideon, Gracie, Jelly, Lou, Martha, No. 1 New, No. 2 New, and October, are all seedlings originated by Peter M. Gideon, of Minnesota, and are, by him, claimed to afford a succession of varieties adapted to the climate of that far northern region. The Cherry crab is claimed to be the parent from which these, together with the Wealthy, have been evolved; although several of them—the last especially—afford, in fruit or tree, more or less decided indication of *malus* parentage.

Bechtel is said to be of *angustifolia* parentage. Its blossoms are large and very beautiful, and as double as miniature roses.

Dartmouth is one of the largest and most beautiful of its class; with the dark, rich, glossy color of the older Hyslop.

Northfield, though tabulated in our *malus* class, is placed among crabs (doubtless correctly) by Downing.

Quaker is a late ripening variety of fair quality. The name was apparently bestowed as expressive of the peculiar, light color of the young wood of the tree, as well as the fruit, which is nearly or quite sweet, and a comparatively long keeper.

APPLES.—*P. Malus*.

A considerable number of the varieties tabulated as fruiting for the first time this season, have so failed to mature good specimens that notices and characterizations are deferred to await the more full and perfect development of their true character.

Borovinka and Oldenburg, as grown here, although distinct, resemble each other so closely in tree, fruit, season and productiveness, that a difference will scarcely be observed by the average fruitgrower.

Gano is understood to have originated in the southwest. Its fine size and showy appearance may render it profitable for market, to which it appears to be mainly adapted.

Garden Royal is by no means new, though but sparsely disseminated. Its rather small size of both tree and fruit specially adapt it to garden planting; while its evenness of size, rich color, and mild, rich flavor, render it an admirable dessert apple.

Golden Reinette, Longfield, Marmalade, Red Aport, Red Dettmer, Rosenhager, Thaler, Titovka, Winter Streifling, Zolotoreff and Zuzoff are from the Russian importations of Prof. Budd and others, although the names of several of them indicate a German origin. Thaler is probably not true to name. The trees are nearly all free growers and most of them early and profuse bearers. In this climate all ripen in early autumn and are only adapted to culinary uses.

Grimes (originally Grimes' Golden Pippin) is one of the few apples, originating in Virginia, which seems to maintain its good qualities when grown as far north as Michigan, although, so far, it lacks productiveness here.

Hawley is large, beautiful and excellent; but deteriorates rapidly after maturity.

□ Hubbardston is large, beautiful and excellent, whether for home or market purposes; from November to midwinter.

Indian is a fickle title, which seems to apply equally to several varieties. The one fruited here comes from Missouri, and is a medium sized September apple of scarcely medium quality.

Jefferis has no superior as a beautiful and excellent dessert apple for September.

Jersey Sweet, as a dessert and culinary sweet apple, has few if any superiors during its season.

Jonathan, as an early and midwinter apple is too widely and favorably known to require description. Here, as elsewhere, to give thorough satisfaction, it should have rich soil and good culture.

Louise, *Princess Louise*, is a comparatively recent Ontario seedling, with many characteristics of the Fameuse family of apples. Promising for both dessert and market.

Lowell is an early and profuse bearer—a fair market variety for September.

McIntosh is another apple of the Fameuse type, of Canadian origin; apparently possessing desirable qualities for both dessert and market, especially at the North.

Minkler is perhaps an old variety, unidentified and renamed. It is more popular farther west.

Munson is a desirable and very beautiful sweet apple; well worth a place, where a sweet apple of that season is desired.

Oakland, *Oakland County Seeknofurther*, is a popular variety in Oakland County, Mich., and quite possibly may be an unrecognized and renamed old apple. Here the tree is an unusually slender, spreading grower, and an early bearer. Fruit beautifully blushed, with a mild, rich flavor.

Ontario, originating in the province of that name, is said to be the result of a cross, between Northern Spy and Wagener, by the late Charles Arnold. The tree proves to be an early and profuse bearer, and the large, fine, fruit keeps well till spring.

Primate has no superior as an August dessert apple; with the drawback, however, that overgrown specimens are likely to become watercored. Its delicate texture, together with its habit of ripening in succession, to some extent, unfit it for the market.

Quince (of Cole) is an old, very highly flavored apple, especially fine for culinary purposes.

Ramsdell Sweet, *English Sweet*, of Downing, is excellent as a late autumn and early winter sweet apple.

Red Astrachan is so well and widely known as scarcely to require mention. For market, it somewhat lacks productiveness.

Red Canada, so long the most popular market winter apple in Detroit and Chicago markets, under the pseudonym—Steel's Red Winter, is no longer successful in the eastern Michigan region where it was once so extensively grown, largely, no doubt, owing to the increased depredations of insects and fungi, and perhaps even more largely to the depletion of soils from continual cropping, without adequate fertilizing. The variety is said to be inclined to scab and crack on some light soils; still it may reasonably be hoped that careful, thorough fertilizing and spraying may largely overcome these difficulties, and, possibly, to some extent, restore its lost prestige. The variety is now fruiting at this station, and even on very light soil, is showing perfect fruit.

Red June is highly valued as an early apple of fine flavor and great beauty. In Michigan it is inclined to scab, crack and overbear.

Roxbury is not quite hardy in Michigan. The tree is of low, spreading habit. The fruit, if kept in close packages to prevent shriveling, is one of the best long keepers.

Sheriff originated in Pennsylvania. Though not of high quality, it is valued farther west, on account of the hardiness of the tree.

Somerset, *N. Y.*, is an early apple of high, sprightly flavor. The tree is an unusually early bearer.

Stark is valued for market, on account of the hardiness, vigor and productiveness of the tree. It is a long keeper, though quite low in quality.

St. Lawrence, ripens at a season when there is an excess of fruits, on which account its real merits are, to some extent, overlooked. It is attractive and valuable, both in tree and fruit.

Summer Pearmain, but for the tendency of the fruit to scab and crack, and that it ripens in the height of the peach, plum and grape season, might well be placed at the head of the list of dessert apples, so far as both beauty and quality are concerned.

Summer Rose, although not the equal of the foregoing in either size or quality, is yet of satisfactory size and quality, and even more beautiful.

Thornton, if at all valuable, is so on account of the vigor and productiveness of the tree. The fruit, though of fine size, is unattractive in appearance and low in quality.

Tolman, *Talman Sweet*, though a very popular long keeper, is objectionably firm and tough in texture, and also lacks juiciness.

Washington *Strawberry*, though ripening in early September, and less desirable for that reason, is large, beautiful, and an early bearer. A good culinary apple.

Water, is an early, profuse bearer, and the tree of good habit, but the variety has many rivals, with equal and even superior merit, at least for this locality.

Wealthy, originated by Peter M. Gideon, of Minnesota, as alleged, from seed of Cherry crab, but its obvious freedom from all indication of crab parentage, begets the suspicion that, by mixture of seed or otherwise, an error may have occurred. Though a winter variety and fairly hardy at the extreme north, it ripens in October in Southern Michigan, where it is only a medium dessert and market fruit.

#### QUINCES—*Cydonia*.

TABULATION OF QUINCES—*Cydonia*—1897.

Name.	Planted.	Bloomed.	Ripe.
Alaska .....	1891	May 22 .....	Middle of October.
Angers .....	1890	.....	.....
Bourgeat .....	1895	.....	.....
Champion .....	1888	May 31 .....	End of October.
Fuller .....	1891	May 29 .....	.....
Hong Kong .....	1888	.....	.....
Meech .....	1888	May 31 .....	Middle of October.
Missouri .....	1890	May 22 .....	Middle of October.
Orange .....	1888	May 22 .....	Beginning of October.
Rea .....	1888	May 22 .....	Beginning of October.
Van Deman .....	1895	.....	.....

Quinces were included in the spraying to which the entire plantation was treated, while yet dormant.

July 1st they were sprayed with Bordeaux in connection with the plums with which they are alternated.

Neither insects nor fungi have been observed attacking either plants or fruit of the quince during the season.

Angers, Bourgeat, and Van Deman, have not yet fruited here.

Hong Kong was planted here as early as 1888. It has proved hardy, and has made moderate annual growth, but has neither bloomed nor fruited.

Champion cannot be depended upon to fully ripen, even in average seasons in Southern Michigan.

## NUTS, 1897.

### ALMONDS.—*Amygdalus communis*.

Luelling, a hard shelled variety, planted in 1892, is hardy and vigorous in this climate. It bloomed on April 29 and ripened the last of October to the first of November. The fruit, though of fine size, proved nearly neutral in flavor. Much of the foliage dropped before the fruit matured.

Soft Shell, planted in 1892, has also proved hardy here. It bloomed for the first time on April 29 last and ripened a light crop of nuts, which were gathered about the middle of October. Although pleasant in flavor they scarcely equaled those offered for sale commercially. This variety also dropped a portion of its foliage prematurely.

### CHESTNUTS.—*Castanea*.

The soil of the location in which chestnuts were planted is apparently not suited to their needs, owing perhaps to retentive clay subsoil a foot or two beneath the surface. Apparently from this cause several varieties have failed, after a year or two of growth.

Of those remaining, Comfort, Hathaway and Japan Giant, have not yet fruited.

Numbo partially matured several burs last autumn from buds which should have remained dormant till spring. As a result it has made little growth and shown no fruit the past season.

Paragon produced a fine crop of nuts the past season, setting far more than it could mature.

Spanish (a seedling of the European type) has also fruited abundantly, although the nuts are rather small for that species and of low quality.

### FILBERTS AND HAZELNUTS.—*Corylus*.

Costford, *Thin Shell* filbert, is yet growing satisfactorily, but has not yet fruited.

Hazelnut plants, received from the national division of pomology in 1892, though healthy and vigorous, have not yet either bloomed or fruited.



Kentish Cob filbert, planted in 1892, is again showing an abundance of catkins, but so far has failed to fruit, though growing satisfactorily, and not noticeably injured by the cold of winter.

PECANS.—*Hickoria (Carya) olivaeformis*.

Trees of this, grown from Iowa seed, prove hardy here, having stood unprotected, without injury, since the nuts were planted in 1890.

Seedlings of Stuart pecan, grown from Texas seed, planted in 1894, although mounded with earth each winter, have yearly been killed nearly to the collar, till in the autumn of 1896, when they were trussed with straw, and earthed up still more deeply, and came out the next spring, nearly or quite uninjured. They were planted in orchard, and are now thoroughly trussed with straw, and mounded with earth.

WALNUTS—*Juglans*

Japan Walnut—*Juglans Seiboldii*, in both tree and fruit, somewhat resembles our native butternut, though the tree is even more vigorous, with large and more glossy foliage, and the smaller and less roughened nuts are produced in greater abundance.

Persian, English or European Walnut, known also as Madeira nut, *Juglans regia*, though apparently hardy here, makes but moderate annual growths, and, though planted in 1890, does not yet afford indications of fruiting.

Praepaturiens, a dwarf variety of the foregoing, planted in 1890, has not yet fruited.

Thin Shell, planted in 1894, is also, apparently, a variety of this species.

APRICOTS—*Armeniaca vulgaris*.

Harris, a variety originating in Central New York, and said to be productive and profitable there, is the only variety now on trial here. It has not yet fruited.

The Russian varieties, for a time highly commended farther west, were on trial here for several years, without satisfactory results. They have been dropped from our lists.

MULBERRIES—*Morus*.

Downing is scarcely hardy enough, even in our Lake Shore climate.

Hicks is a Southern variety and quite popular there, but it fails to maintain its qualities in our Michigan climate.

New American is hardy and very productive. Its fruit ripens in succession, during a period of six or eight weeks, and is of fine size and very pleasant flavor.

NECTARINES—*Persica vulgaris*.

Pitmaston bloomed the past year, for the first time, on May 4th, and set a light crop of fruit, which, however, was ruined by the curculio, not a specimen escaping.

Kentucky, understood to be a recent seedling from that state, comes to us, in bud, from the National Division of Pomology. The buds were inserted, in 1896, in a tree of bearing age, and may, perchance, fruit the coming year.

ASPARAGUS—*Asparagus officinalis*.

Palmetto may still be regarded as the preferable one among the older varieties.

Columbian, *Mammoth White*, which has been planted more recently, is even superior to the former in some respects.

Owing to its dioecious character, it would seem doubtful if the peculiar characteristics of a variety can be maintained in the process of reproduction from seed, otherwise than by the isolation of the seed-bearing parent, and farther, by the selection of the young plants, with careful reference to the desired type.

RHUBARB—*Rheum rhaponticum*.

The plantation of rhubarb having become crowded and deteriorated, on account of long standing in the same ground, the plants have now been removed and a new plantation made.

Linnaeus, has pretty well demonstrated its superiority as compared with the varieties with which it has been tested, although its superiority as compared with several others is but slight.

Bailey, received from S. S. Bailey, of Kent county, Michigan, is the only variety replanted for farther trial.

T. T. LYON.

South Haven, Mich., January 15, 1898.

**VEGETABLE TESTS OF 1897.**

BY L. R. TAFT, H. P. GLADDEN AND M. L. DEAN.

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As in previous years we grew most of the new varieties sent out by the seedsmen, as well as many of the standard sorts, and kept careful notes upon their behavior. We also undertook quite a line of experiments in methods of culture and the use of various fertilizers, particularly with potatoes and celery, but the excessive rains during August so affected the results as to make it impossible to draw correct conclusions.

**BUSH BEANS.**

Variety.	Seedsmen.	Date edible.	Number of pods on one plant.	Weight of pods on one plant. Ounces.	Average weight of single pod.
Black Valentine .....	Henderson .....	July 26	71	11½	.162
Cream Valentine .....	" .....	" 29	109	20½	.137
First in Market .....	Landreth .....	" 26	80	10	.111
Fuller Black Wax .....	Gregory .....	" 28	108	18½	.171
Improved Goddard .....	Ferry .....	Aug. 7	61	11	.180
Lima Wax .....	Dreer .....	" 9	97	9	.093
Refugee .....	Livingston .....	" 7	63	9	.143
Stringless Green Pod .....	Burpee .....	" 2	121	20½	.169
Union White Valentine .....	Johnson & Stokes .....	" 21	16	2½	.156
Vineless Marrow .....	Ferry .....	" 16	43	7½	.174
Warren .....	Gregory .....	" 7	58	6½	.112
Yocanite Wax .....	Johnson & Stokes .....	" 2	110	17	.155
Byer's One Bean .....	Byer Bros. ....	" 11	271	47	.169

## NOTES ON VARIETIES.

The following sorts have not been heretofore described in our bulletins:

*Black Valentine*.—The plants are of moderate growth and quite badly affected with rust. The pods are longer than the common Red Valentine and not curved; light green in color, tender and the quality is of the best. Scarcely so productive as some other sorts of the same season.

*Cream Valentine*.—Plants of vigorous, healthy growth. Pods longer, darker green, more curved, round and remain much longer in edible condition than Black Valentine, though the quality is not so good. Productive. A good, early, green-podded sort.

*First in Market*.—Plants of rather small growth and rusted badly. Pods long, green, curved and flattened. The variety is very slow to form beans in the pods and so it has a long edible season. It is early, but scarcely so productive as the Valentine class.

*Improved Goddard*.—This is an excellent sort to use as a green-shelled bean, as the beans are large, handsome in appearance and of fine quality.

*Union White Valentine*.—This variety has been grown for two seasons and has been very unproductive.

*Vineless Marrow*.—This is a field sort that is strong and healthy in plant growth and quite free from runners. The beans are extra large and fine in quality. A most excellent baking sort.

*Byer's One Bean*.—Plants of healthy, vigorous growth, very branching and productive. The pods are 5-6 inches long, round, nearly straight, green in color, very brittle and fine in quality. The plants are very productive and have a long season of bearing.

It is a valuable sort for the home garden or market.

Of the older sorts that have been grown for several seasons, some of which are omitted from the above table, *Cylinder Black Wax*, *Flageolet Victoria* and *Saddle-back Wax*, among the yellow-podded sorts, and *Red Valentine* and *Stringless Green Pod* among the green-podded, are worthy of mention as sorts of high excellence.

## SUMMARY OF VARIETIES.

The following wax sorts have given the best satisfaction here:

*Cylinder Black Wax*, *Flageolet Victoria*, and *Golden Wax*.

Among the better green-podded varieties are: *Red Valentine*, *Cream Valentine*, *Stringless Green Pod*, and *Byer's One Bean*.

*Improved Goddard* as a shell bean would give good satisfaction.

## POLE BEANS.

The cold, wet weather of June was very injurious to the seed of the pole varieties of beans planted, and it was almost impossible to get a good stand of plants. The frost of September 20 killed several sorts before they had matured edible pods or beans. For these reasons we have not attempted to tabulate the varieties grown the past season.

The following sorts matured sufficiently for partial notes to be taken:

*Golden Lima*.—Plants do not grow very high, but make a bushy growth at the bottom where a large crop of pods is borne. Very few pods had

beans of edible size at time of frost. The beans were green in color and had not yet attained the rich golden claimed for them.

*Mammoth Podded Horticultural*.—Plants are of low, bushy growth. Pods dark green, streaked with carmine. But few pods had edible beans at time of frost.

*Mastiff*.—Plants of very strong growth and very productive. Pods straight, 6–8 inches long, broad, golden yellow in color, fleshy, and excellent in quality. This variety matured a fair proportion of pods before frost. It is an excellent wax pole bean.

*Powell's Prolific*.—Plants are very vigorous, growing to the top of the poles 8 to 9 feet high, and very prolific with pods from bottom to top of vines. Pods 5 to 6 inches long, round, regular in form and light green in color. The pods are very handsome in appearance with solid flesh of the finest quality. The variety was edible September 7, and remained in condition a long time. Valuable for earliness, productiveness, fine quality, and handsome appearance.

*Seibert's Early Lima*.—Plants strong, growing to tops of poles and productive. Pods are large, broad and contain 3 to 4 large beans that are excellent in quality. Edible September 16. One of the earliest and most valuable of the pole limas.

#### BUSH LIMAS.

Henderson's was the only one of the bush limas to mature edible beans before the plants were killed by frost.

#### CUCUMBERS.

The cucumbers were planted June 9. The following table gives the relative productiveness, time of maturing, and size of the varieties planted:

Variety.	Seedsman.	Productiveness.	Date of pickling size.	Date of slicing size.	Average weight of single fruit. Ounces.
Arlington White Spine.....	Vaughan.....	90	Aug. 5	Aug. 9	7
Astro.....	Leonard.....	40	" 6	" 11	9.5
Beauty.....	Childs.....	85	" 2	" 7	7.5
Choice.....	Landreth.....	88	July 29	" 3	8.5
Emerald.....	Livingston.....	75	Aug. 5	" 10	9.5
Fordhook.....	Burpee.....	90	" 6	" 11	9.75
Goliath.....	Vaughan.....	80	" 4	" 9	17
Green Prolific.....	Ferry.....	92	" 2	" 7	7.5
Hill's Forcing.....	Vaughan.....	90	" 7	" 12	11
Japanese Climbing.....	Maule.....	92	" 11	" 15	18
None Such.....	Salzer.....	83	" 5	" 10	11.5
Sixty Day.....	".....	94	" 4	" 9	12
Westerfield Pickling.....	Ferry.....	95	July 25	July 31	9.5

#### NOTES ON VARIETIES.

*White Spine* (Arlington).—This type is the general favorite among growers and market men and is the sort most largely grown for table use.

*Astro*.—Plants of small growth and few fruits borne. Leaf stalk short and leaves thicker in texture than those of most sorts. Fruits 6–8 inches

long, 2 inches in diameter, round with few very short black spines; color a dark green. Excellent in flavor, but not firm or crisp. Unproductive and undesirable among the better sorts.

*Beauty*.—Plants of good growth. Margins of leaves quite deeply cut and spiny. Fruits 4-5 inches long, 2-2½ inches in diameter and triangular. The color is dark green and the spines are few, short and white. The form of the fruits is too short and thick for early pickles or for slicing.

*Choice*.—Plants are of vigorous, healthy growth. Fruits 5-6 inches long, 1½ inches in diameter, somewhat curved, light green, nearly white in color, with short, stout, black spines. The variety is early and the fruits are good form for pickling or slicing purposes. An excellent general sort.

*Emerald*, *Fordhook*, *Green Prolific* and *Hill's Forcing* are excellent sorts for pickling and for table use. *Emerald* remains a long time in condition before ripening.

*Goliath*.—A large fruiting sort, excellent for home use, but too large and irregular in form to sell well in market.

*Japanese Climbing*.—This variety has been grown for several seasons. While the vines have a tendency to climb, they do well grown in the ordinary way. It is not so early as some others, but the fruits are of good form, attractive in appearance, fine in quality, and the plants are productive. A most excellent sort for pickling or for table use.

*None Such* and *Sixty Day* are closely of *White Spine* type and are good sorts, but the *White Spine* is preferable because a standard variety.

*Westerfield Pickling*.—Plants of very strong growth, healthy and productive. Early. A most excellent pickling sort, also a good table variety if left to get of proper size.

#### SUMMARY OF VARIETIES.

For early pickles: *Russian*.

For early slicing and pickling: *Choice* and *Westerfield Pickling*.

As general sorts for table and market: *White Spine* and *Japanese Climbing*.

#### LETTUCE.

*Grand Rapids*, of the loose growing sorts, has given the best results in the forcing house and hot beds. This variety gives a greater weight of crop from a given space and is less susceptible to rot than any other of the several kinds tried.

Where there is a demand for a close heading variety, *Tennis Ball*, *Boston*, and *Rawson's Hot-House* are excellent sorts to grow. The heading varieties must bring a higher price per pound than the loose sorts to make their growing profitable.

Seed for the varieties grown out doors was sown in the forcing-house March 24th, and the plants were removed to open ground May 13th. The table below gives the data obtained from this planting.

Variety.	Seedman.	Date of maturity.	Average weight of a single head.
All Seasons.....	Dreer.....	July 6	12 oz.
Asparagus.....	".....	June 28	18 oz.
Belmont.....	".....	" 24	4 oz.
Big Boston.....	".....	" 27	9 oz.
Brown Dutch.....	Ferry.....	July 2	11 oz.
Brown and Gold.....	Vaughan.....	" 5	9½ oz.
Cos.....	Burpee.....	" 8	1 lb 10 oz.
Defiance.....	Vaughan.....	" 2	9 oz.
Denver Market.....	Ferry.....	" 2	14 oz.
Half Century.....	Childs.....	" 2	15 oz.
Imperial.....	Vick.....	June 25	12 oz.
Italian Ice.....	Burpee.....	July 2	15 oz.
Landreth Earliest.....	Landreth.....	" 2	1 lb. 2 oz.
Mammoth Cabbage Head.....	Vaughan.....	June 29	1 lb. 8 oz.
Market Gardener's Detroit Forcing.....	Ferry.....	July 6	18 oz.
Mignonette.....	Henderson.....	" 1	4½ oz.
Morse.....	Burpee.....	June 30	1 lb. 2 oz.
Ninety and Nine.....	Vaughan.....	" 24	4 oz.
Premium Cabbage.....	Vick.....	" 30	8½ oz.
Rawson's Hot House.....	Vaughan.....	" 21	4 oz.
Sensation.....	Johnson and Stokes.....	" 30	3 oz.
Simpson's Curled.....	Ferry.....	July 5	1 lb. 5 oz.
Sumatra.....	Landreth.....	" 2	13½ oz.
Treasure.....	Johnson and Stokes.....	" 5	13 oz.
Wonderful.....	Dreer.....	" 2	1 lb. 8 oz.

## NOTES ON VARIETIES.

*Asparagus*.—A *Cos* variety growing from 14–18 inches high. The leaves are very narrow. It makes too little growth in the center to be a desirable sort for tying up and blanching.

*All Seasons*.—Forms a rather close head from 12 to 15 inches in diameter. The outer leaves are large, round and smooth in general outline and of a dark green color. The inner leaves are of a rich, golden yellow color, tender and of good quality. The variety is well adapted to out door culture, as it stands heat well and is slow in forming a seed-stalk.

*Belmont*, *Boston*, *Denver Market*, *Rawson's Hot House* and *Sensation* are desirable sorts for the forcing-house or hot-bed, but give little satisfaction grown as out door varieties.

*Brown Dutch*.—Forms a close, compact head from 8 to 10 inches in diameter. The inner leaves are of a light yellowish green, tender and of very fine quality. An excellent dark-colored sort and it stands heat well.

*Brown and Gold*.—This sort resembles the preceding, but the leaves are more crinkled, the heads smaller and have fewer outer loose leaves. It is a little later than *Brown Dutch* and scarcely as good a variety.

*Defiance*.—This variety forms a close head which is tender but not of very good quality. The heads are too small and the sort is not so desirable as some of the larger growing kinds.

*Half Century* and *Treasure*.—These two sorts are very similar in appearance, though the heads of the *Half Century* are a little larger in size and more uniformly developed. The type is closely like *Brown Dutch* in leaf and habit of growth, but the leaves are lighter green in color and the heads closer and more compact. They are excellent sorts.

*Imperial*.—This was the first of the large growing sorts to mature heads. Heads 10 to 12 inches in diameter, light green in color, very tender and the quality is good. Valuable for earliness and good quality.

*Italian Ice*.—Forms a loose but not open head. It is a large growing sort and the tenderness and fine quality of the inner leaves is very marked. It sends up a seed-stalk very quickly. A fine sort for garden growing.

*Landreth Earliest*.—It forms a loose, open head that can be cut for use as soon as it has reached sufficient size. If allowed to mature, the heads are large and of fine texture and quality. A valuable large-growing sort. It is also a good variety to grow in the frames or forcing-house.

*Mammoth Cabbage Head*.—A large-growing sort forming a rather loose head. The leaves are quite smooth and regular in outline and the head is, perhaps, not so attractive in appearance as some of the more crinkled sorts. It is very tender and of fine quality. The variety soon goes to seed.

*Ninety and Nine*.—A lettuce of the *Tennis Ball* type but a poorer grower. A good forcing sort, but of little value out doors.

*Simpson's Curled*.—An old sort but one of the best grown. It is a little later in season than some others, but the large heads, fine appearance and good quality of this variety make it well worthy of a place in every garden.

*Sumatra Curled*.—Appears to be identical with *Denver Market*.

*Premium Cabbage*.—A variety of the *Tennis Ball* type but a somewhat larger grower and a little later in maturing.

*Wonderful*.—Forms a very large head, 15 to 17 inches in diameter and quite firm. The outer leaves are large, dark green, much waved and crinkled. The inner leaves are of a rich, golden yellow color, very tender and of fine quality. It remains a long time in condition before sending up a seed-stalk. A very fine variety.

#### SUMMARY OF VARIETIES.

For forcing purposes, *Grand Rapids* of the loose-growing and *Tennis Ball* or *Rawson's Hot House* of the cabbage-heading sorts, have given the most satisfactory results.

*All Seasons*, *Half Century*, *Landreth Earliest*, *Italian Ice*, *Simpson's Curled* and *Wonderful* are recommended for out-door growing.

#### PEPPERS.

Peppers are not commonly grown in the kitchen garden, possibly because their uses are not better known or their culture considered difficult. The seed should be sown in boxes in the house, or, preferably, in a frame out-doors, from the middle to the last of March. The plants should not be set out until all danger from frost is over. The varieties are quite different in size, form and number of fruits produced and in the time of ripening.

The following notes may aid the grower in selecting the varieties best suited to their needs:

*Cardinal*.—The fruits are 6 to 8 inches long, 1 inch in diameter at base and tapering. The variety is of early maturity and a rich, dark red color, but the fruits are so curved and twisted as to be unattractive in appearance.

*Cayenne Red*.—Somewhat similar to preceding, but fruits are smaller and shorter and a lighter red in color. The plants are very productive and the fruits very sharp in flavor.

*Cherry*.—This variety bears fruits that are round and about one inch in diameter. The plants are ornamental but the fruits are of little value.



*Coral Gem Bouquet*.—The fruits are one inch long and  $\frac{1}{2}$  inch in diameter. The plants have finely cut foliage and are thickly set with the small fruits making a very ornamental plant. This is the sort usually grown for small peppers. It is early and usually matures the fruits before frost comes.

*Elephant's Trunk*.—This variety bears long, large, irregular fruits that usually do not ripen before frost.

*Golden Dawn*.—The plants are productive and the fruits regular in form, large and of a rich golden yellow color. A desirable yellow sort.

*Kaleidoscope*.—The fruits are small, ridged and of little value. As an ornamental plant, because of the constantly changing colors of the fruits borne, it has a place.

*Large Bell*.—This is the sort usually grown for commercial purposes. The fruits are 3 to 4 inches long and 2 to 3 inches in diameter, quite smooth and regular in form and mild in flavor. The best sort for general cultivation.

*Ruby King*.—The fruits are much larger in size than the *Large Bell*, but not so many are borne and the variety is later in ripening.

#### TOMATOES.

The seed was sown in the forcing-house, March 19. The seedlings were transplanted April 4, and the plants set out in the field June 4. The plants made a good growth early in the season but did not bear one-half the usual crop of fruit. While this failure in crop may be due, in part, to the frequent rains occurring when the fruits were setting, the greater loss was caused by the fungus *Septoria Lycopersici*. This disease attacks the leaves and stems, causing the foliage to dry up and drop off, thus stopping further development of the fruit. The disease is new to this country and promises to be very destructive to the tomato crop. Some varieties seem to be more susceptible to attacks of the fungus than are others. It is probable that Bordeaux mixture will be found a remedy. The damaging nature of the disease was not known until late in the season and, although Bordeaux was then applied, it did little to prevent the loss in crop. Next season, earlier and more thorough treatment will be undertaken to control the disease.

In the table below will be found the date of first fruit ripening; the number and weight of fruits produced on one plant to September 3, and in the next column the total crop of ripe fruit borne on the same plant during the season. The average weight of a single ripe fruit is given, also the amount of green fruit on the plant when it was killed by frost (September 21). By dividing the crop into the two periods, the earliness of the varieties is more readily determined and a better index of value given than if the total crop produced was reported in one column.

The (c) following the seedsman's name in the table indicates that the variety has been grown one year at the College and seed saved from that planting for the present test.

## TOMATOES.

Variety.	Seedsman.	Date of first ripening	Fruit ripe Sept. 3.		Fruit ripe Sept. 20.		Average weight of a single ripe fruit—Ounces.	Weight of green fruit on plant at time of frost.
			No.	Wt.	No.	Wt.		
				lbs. oz.		lbs. oz.		lbs. oz.
Acme.....	Vaughan (c).....	Aug. 8	14	5 6	28	11 2	6.35	9 3
Advance.....	College.....	" 11	75	13 3	177	28 1	2.46	11 14
Alexander.....	Moore (c).....	" 19	19	3 12	74	16 10	3.59	12 8
Atlantic.....	Buckbee (c).....	" 10	82	20 15	100	25 7	4.47	4
B. B.....	Johnson & Stokes (c).....	" 23	1	-- 7	25	10 8	6.72	30 11
Beauty.....	Vaughan (c).....	" 15	77	21 0	128	37 5	4.19	8 12
Brandywine.....	College.....	" 19					5.90	
Bright and Early.....	Dreer (c).....	" 21	19	2 10	122	19 5	2.53	18 7
Buckeye State.....	Livingston.....	" 29					7.25	
Chemin.....	Thorburn (c).....	" 26					4.58	
Conqueror.....	" (c).....	" 10					3.50	
Crimson Cushion.....	Henderson (c).....	" 23					7.62	
Criterion.....	Vick (c).....	" 21					3.00	
Cross Bred.....	Landreth (c).....	" 29					5.90	
Cross No. 3.....	Va. Agr'l College (c).....	" 16					7.70	
Daybreak.....	Dreer (c).....	Sept. 2	1	-- 4	10	2 15	4.70	15 12
Democrat.....	Thorburn (c).....	Aug. 26	3	1 6	10	4 9	7.30	12
Diamond.....	Childs.....	" 23	1	-- 6	17	6 6	6.00	16 14
Dwarf Aristocrat.....	Buckbee (c).....	" 17	5	1 11	20	5 8	4.40	7 8
Dwarf Champion.....	Vaughan (c).....	" 19	5	-- 15	14	2 15	3.35	4 8
Earliest (Select Early).....	College.....	" 7	103	14 2	138	18 1	2.09	1 3
Earliest (Round).....	".....	" 9	58	11 10	108	21 15	3.25	5
Earliest (Oblong).....	".....	" 7	48	8 15	74	13 4	2.88	5 1
Favorite.....	Vaughan (c).....	" 20	4	1 14	14	6 10	7.57	13
Ferris Wheel.....	College.....	" 26					7.25	
Fiji.....	".....	" 23	14	4 1	30	8 12	7.66	5
Fordhook.....	Vaughan (c).....	" 26	8	2 8	16	5	5.00	15
Fortune.....	Johnson & Stokes (c).....	" 19	13	4 14	41	16 7	6.16	15 14
Golden Jubilee.....	Childs (c).....	" 20					9.00	
Golden Queen.....	Vaughan (c).....	" 20	1	-- 5	14	4 2	4.71	26 10
Honor Bright.....	Livingston.....	" 29	43	10 12	51	12 7	3.90	15 12
Hybrid No. 1.....	Landreth.....	" 17					4.42	
Hybrid No. 4.....	".....	" 22					4.85	
Hybrid No. 22.....	".....	" 27					3.66	
Hybrid No. 25.....	".....	" 23					3.00	
Hybrid No. 50.....	".....	" 19					4.25	
Ignotum.....	College.....	" 21	6	3 5	19	7 3	6.05	
Imperial.....	Mauie (c).....	" 19	13	4 8	31	10 11	5.51	13 6
Ivory Ball.....	Landreth (c).....	" 21					1.28	
Jersey.....	".....	" 23	8	1 8	50	11 2	3.56	20
La Crosse.....	College.....	" 16	17	4 7	32	8 9	4.28	6 9
Large Red.....	".....	" 19					4.80	
Leader.....	Vick.....	" 9	68	14 13	110	23 9	3.43	5 11
Lemon Blush.....	Thorburn (c).....	" 23					5.83	
Lemon Yellow.....	Livingston.....	" 23	5	1 6	25	5 5	3.40	6
Lorillard.....	Dreer.....	" 23					6.30	
Mayflower.....	Burpee.....	" 23	10	3 9	39	12 13	5.23	21 8
McCollum Hybrid.....	College.....	" 23	1	-- 5	9	3 5	5.76	21
Miner.....	Miner (c).....	" 29	5	2 2	8	3 11	7.37	6 5
Minnesota.....	Dreer.....	" 17	39	7 1	89	17 10	3.17	12 3
Money Maker.....	Landreth (c).....	" 21					5.30	
Novelty 22.....	" (c).....	" 19					2.75	
Northern Light.....	College.....	" 29					10.12	
Number 81.....	".....	" 29					4.00	
Number 105.....	Johnson & Stokes (c).....	" 23	13	5 5	20	7 13	6.25	16
Optimus.....	College.....	" 21	14	3 5	25	7 3	4.60	24 8
Perfection.....	Vaughan (c).....	" 23					7.95	
Ponderosa.....	Henderson (c).....	" 21					7.50	
Potato-leaf.....	College.....	" 27					7.24	
Potato-leaf Ignotum.....	".....	" 19	21	9 12	34	16 15	7.97	8 4

TOMATOES.—*Concluded.*

Variety.	Seedsman.	Date of first ripening	Fruit ripe Sept. 3.		Fruit ripe Sept. 20.		Average weight of a single ripe fruit—Ounces.	Weight of green fruit on plant at time of frost.
			No.	Wt.	No.	Wt.		
Potato-leaf Ignotum (Sport).....	College.....	Aug. 21	16	lbs. oz. 4 7	29	lbs. oz. 11 10	4.49	lbs. oz. 4 3
Prelude.....	Dreer.....	" 16					2.12	
Purple Cross.....	Landreth (c).....	" 23					5.60	
Puritan.....	Thorburn (c).....	" 22					6.10	
Ruby.....	Henderson (c).....	" 16					3.41	
Seedling.....	West Va. Station (c).....	" 29					8.33	
Shah.....	College.....	" 27					7.20	
Stone.....	Vaughan (c).....	" 27					6.90	
Ten Ton.....	Landreth (c).....	" 23	18	5 5	38	11	4.62	
Terra Cotta.....	Thorburn (c).....	" 23	23	6 6	40	10 1	4.02	
Thorburn.....	" (c).....	" 29					7.80	
Tree.....	Buckbee (c).....	" 29					4.75	
Turner Hybrid.....	Vaughan (c).....	" 27	1	8	10	4 7	7.10	
Trophy.....	" (c).....	" 22	7	2 14	25	9 11	7.05	
Virginia Corker.....	Landreth (c).....	" 27					8.75	
Volunteer.....	Vaughan (c).....	" 23					6.12	
Yellow Cherry.....	" (c).....	" 19						
Yellow Egyptian.....	" (c).....	" 19					3.70	
Yellow Peach.....	Vaughan (c).....	" 21					1.87	
Yellow Plum.....	" (c).....	" 16						

## NOTES ON VARIETIES.

The following sorts, most of them new, have not been previously described in our bulletins:

*Diadem*.—The plants were of strong growth and quite free from disease. The fruits are large, round, regular, somewhat flattened. Color a rich red with golden yellow streaks running from base to apex. Unique and handsome in appearance. The flesh is bright in color and of very good quality.

*Fiji*.—The plant is of healthy, stout, tree growth, closely like *Dwarf Champion* and the fruits closely resemble those of that variety, but are larger in size and darker purple in color. *Dwarf Champion*, while ripening a few fruits early, is rather late to ripen the bulk of the crop. *Fiji* was a few days later in ripening first fruits, but produced a much larger crop before frost than did *Dwarf Champion*, and as the fruits are larger it seems preferable to that variety for the grower.

*Honor Bright*.—Plants of strong, healthy growth; leaflets small, light yellowish green; leaf-stalk and stems yellow. Distinct in plant appearance. Fruits of medium size, round, flattened, regular form. The color is light green, then white, changing to yellow and finally becoming a rich red when fully ripe. The flesh is very solid, of high quality, and firm, and the variety would be excellent for shipping.

*Lemon Yellow*.—Plant of *Dwarf Champion* type, though larger and stouter in growth. Fruit round, somewhat elongated in form; color a bright, clear yellow; skin thin; cells quite large, open. Of fair quality.

*Mayflower*.—Closely resembles *Ignotum* in plant, but the fruits are scarcely so large and the color is darker red. The tomatoes grow in clusters, color very evenly, do not crack and are of best quality.

*Number 81*.—Plants are of weak growth and badly defoliated by fungus. Fruits are of medium size, flattened, often quite irregular and yellow in

color. The flesh is solid but poor in quality. Some other yellow sorts have larger fruits and are better in quality.

*Yellow Egyptian*.—Plants of straggling growth and finely cut foliage. Very productive, but the fruits are too small for a yellow sort when there are varieties that have much larger tomatoes.

The following sorts have been grown for two or more seasons:

*Acme*.—The plants of this well-known variety were of healthy growth and productive. The fruits are large, regular in form and of a popular color. One of the best sorts for the general grower.

*Advance*.—We have grown this variety for many seasons and have found no better second early sort. The variety is very productive and while the fruits are not large, they are very regular in form and even in ripening. This season the variety was badly attacked by the fungus.

*Beauty*, *Ignotum*, *Optimus* and *Perfection* are among the best of the large red fruited sorts. *Beauty* and *Optimus* suffered more from fungous attack than did *Ignotum* and *Perfection*.

*Dwarf Aristocrat* seems preferable to *Dwarf Champion* on account of the larger fruits and the earlier ripening of the bulk of the crop. The fruits, however, are red and have not the dark purple color of *Dwarf Champion*.

*Earliest*.—We have made a specialty of this variety for several seasons, endeavoring to improve the size and regularity of the fruits without losing anything in earliness. Plants were grown from a strain of seed selected with special reference to early fruiting. Also an attempt will be made to fix a more regular type of oblong and round fruiting sorts. By reference to the table, it will be seen that the early strain produced earlier fruits, but the tomatoes were smaller in size. *Earliest* has a place to a limited extent, as a first ripening sort. The variety suffered more from *Septoria Lycopersici* than any other sort in the field. *Atlantic*, *Leader* and *Ruby* are much the same in form, but have larger fruits and are a few days later in ripening.

*Potato-leaf Ignotum*.—Plants of strong growth though somewhat defoliated by fungus. The fruits were larger, and earlier in ripening and the plants more productive than either *Ignotum* or *Potato-leaf*. A very desirable sort for the general grower.

*Terra Cotta*.—A variety having a thin, velvety skin and flesh of a rich red color and excellent in quality. A fine sort for home use.

#### SUMMARY OF VARIETIES.

*Vaughan's Earliest* is one of the best early ripening sorts. *Atlantic*, *Leader*, or *Ruby* closely follow *Earliest* in season and bear larger fruits.

*Advance* is a most excellent early sort bearing smooth fruits.

*Potato-leaf Ignotum*, *Acme*, *Beauty*, *Ignotum*, *Perfection* and *Optimus* are excellent sorts for general crop.

*Golden Queen* is one of the best yellow sorts.

*Miner* and *Ponderosa* bear large fruits that are very solid and of good quality, but late in ripening.

## CABBAGES.

The test of cabbages included a selection from last year's list of twelve early, fourteen medium, and seventeen late varieties.

The seed of the early sorts was sown in boxes, in the forcing house, March 23. The medium varieties were sown April 6. As soon as the plants reached proper size, they were pricked out into flats and remained there until May 17th and 18th, when they were planted in the field.

The late seed was sown in a cold frame, May 18. The young plants were thinned to the proper distance and remained in the bed until they were transplanted in the field, June 26.

Variety.	Seedsman.	Season.	Date.		No. of days from transplanting to maturity.	Number of plants headed.	Total weight.	Average weight.
			First mature head.	Market maturity.				
All Head.....	Burpee	Early	Aug. 2	Aug. 12	87	9	81.5	3.5
All Head.....	Vaughan	"	" 2	" 12	87	6	24	4
Bullock Heart.....	Landreth	"	" 1	" 10	85	11	33	3
Early Spring.....	Vaughan	"	" 2	" 10	85	14	42	3
Early York.....	King	"	" 2	" 8	83	7	17	2.43
Express.....	Vaughan	"	" 3	" 14	89	10	30	3
Henderson's Summer	"	"	July 27	" 8	81	10	30	3
Landreth's Earliest	Landreth	"	" 28	" 10	82	5	16	3.2
Reedland Drumhead	"	"	" 28	" 12	80	11	44	4
St. John's Day.....	Henderson	"	" 28	" 10	82	12	30	2.5
Wakefield, Early Jersey	Vaughan	"	Aug. 2	" 10	87	9	36	4
Winnigstadt.....	Ferry	"	" 4	" 16	89	8	20	2.5
All the Year Round	Landreth	Medium	" 10	" 19	93	3	9	3
Autumn King.....	Henderson	"	" 10	" 19	93	10	40	4
Ball Head.....	Burpee	"	" 19	" 23	97	9	30	3.33
Braunschweiger.....	Salzer	"	" 19	" 24	98	4	14	3.5
Long Island.....	Brill	"	" 15	" 20	94	6	22	3.66
Lupton.....	Burpee	"	" 16	" 20	94	1	-----	5.5
Mid-Summer.....	Maule	"	" 14	" 20	94	11	52	4.72
Salzer's Ideal.....	Salzer	"	" 2	" 10	84	14	94	6.71
Short Stem.....	Henderson	"	" 10	" 20	94	6	28	4.6
Succession.....	"	"	" 12	" 20	94	8	47	5.62
Sugar Head.....	Vaughan	"	" 16	" 26	100	9	33	3.66
Sure Head.....	Burpee	"	" 14	" 25	99	9	55	6.1
Vandergaw.....	Vaughan	"	" 2	" 14	88	6	18	3
World Beater.....	Burpee	"	" 12	" 20	94	5	20	4
Champion Drumhead	King	Late	Oct. 1	*Nov. 10	97	8	71.68	8.71
Colosus.....	Salzer	"	" 1	" 10	97	25	253.45	10.39
Danish Ball.....	Burpee	"	Sept. 28	" 10	94	22	254.5	11.75
Diamond Winter.....	Gregory	"	Oct. 4	" 10	101	23	184.69	8.03
Dutch Winter.....	Vaughan	"	" 10	" 10	108	23	114.31	4.97
Flat Dutch.....	Ferry	"	" 15	" 10	111	22	121	5.5
Hollander.....	Buckbee	"	" 1	" 10	97	20	137.5	6.87
Ideal Winter.....	"	"	" 2	" 10	98	18	104.5	6.03
Late Mountain.....	Landreth	"	" 15	" 10	111	10	71	7.1
Mammoth Rock.....	Johnson & Stokes	"	" 14	" 10	110	21	102	4.85
Mammoth Rock Head	"	"	Sept. 29	" 10	96	19	90.5	4.16
N. B. G. & Co. 100 Weight	N. B. G. & Co.	"	Oct. 4	" 10	100	15	87	5.8
New Rock Head.....	Johnson & Stokes	"	" 2	" 10	98	25	159.15	6.39
Premium Flat Dutch	Ferry	"	" 8	" 10	104	24	131	5.45
Red Drumhead.....	"	"	" 4	" 10	100	18	114.5	6.37
Stone Mason.....	Vaughan	"	Sept. 30	" 10	95	19	142.7	7.3
Warren.....	Gregory	"	Oct. 1	" 10	97	21	118.86	5.66

\* Date harvested.

The early and medium varieties were watered by surface irrigation, when the heads were about half grown, and again ten days later. They were planted in rows three and one-half feet apart using twenty plants of each variety, the plants having a space of twenty inches in the row. In the late plot, twenty-five plants were used, and water was applied several times.

The cabbage maggot (*Phorbia Brassicæ*) attacked the early and medium varieties, and destroyed many of the plants.

The tables include the varieties that were most promising last year and proved true to name.

A collection of the best early varieties might include: Henderson's *Early Summer*, *Wakefield*, *Early Drumhead*, *All Head* and *Early York*, all of which produce large, well formed, solid heads of fine quality.

Among the best medium varieties, some of which produce heads equal to the winter sorts, are: *Autumn King*, *Lupton*, *Mid-Summer*, *Succession* and *World Beater*.

#### NOTES ON LATE VARIETIES.

*Champion Drumhead*, from John K. King, Coggeshall, Essex, England, is of the Drumhead type, but the seed was slightly mixed as a few of the plants produced large, loose, flabby heads.

The typical heads were broad, deep and flat, tender, crisp, and very white. It is a strong, rank grower, and has a large amount of superfluous foliage covered with a greenish-purple bloom; stem, short and stout. If true to type, it would be of value as a late variety.

*Colossus*, sent out by Salzer, is a strong growing and sure heading variety that has gained prominence on account of its large, firm, crisp heads, and excellent keeping qualities.

*Danish Ball*, from Burpee, a strong plant, true to type. The heads are of good size, round, solid, crisp and tender. The stem is of medium length, rather slender and weak; foliage thick, leathery, covered with a light blue bloom, and sets closely around the heads.

A good variety for a firm, round medium sized head, possessing rare keeping qualities.

*Diamond Winter*, one of Gregory's specialties, produced very large, solid heads of the *Flat Dutch* type. The plants were strong; foliage light green with bluish white bloom. Heads broad, flat, true to type and were well covered with leaves; stem short, stout.

*Dutch Winter* from Vaughan, and *Buckbee's Hollander* are nearly identical, except that *Dutch Winter* set a few more heads.

The plants were strong, making a rank growth; heads small, round, very hard, deeply set in an extra amount of leaves; foliage thick, greenish purple covered with a blue white bloom; stem short and stout. Very much like the *Danish Ball*. All three varieties possess qualities that make them desirable for winter use.

*Flat Dutch* and *Premium Flat Dutch* from D. M. Ferry & Co. are standard late varieties with which other sorts are compared.

The plants are hardy; heads large, broad, flat, and deep, of a bluish green color and when cut open, are crisp and tender, and have a pleasant flavor. The leaves are thick, of bright green color and covered with light blue bloom; stem short, stout.

These varieties should be grown in every home garden, owing to their hardiness and their edible and keeping qualities.

*Ideal Winter* is one of A. W. Livingston's Sons' novelties that proved to be of value either for immediate use, or keeping purposes.

The plants seemed to be strong growers, not easily affected by dry weather. The heads were medium to large, true to the type of the *Drumhead*, broad, flat, deep, very crisp and tender; foliage thick, light green with a purple border. The superfluous leaves are numerous. A variety worthy of trial.

*Late Mountain*, Landreth, is a strong growing, short-stemmed variety that developed rather soft, medium-sized heads, covered with a large amount of extra foliage.

The leaves are thick, glaucous, and of a dark green color; stems short and stout.

*Mammoth Rock* and *Mammoth Rock Head*, both from Johnson & Stokes, showed no marked difference. They produced strong-growing plants with short, stout stems.

The heads were of good size, round, solid, of deep red color, tender and of fine flavor; foliage thick, covering the heads; color deep purple with light blue bloom, making them very attractive in the garden.

*N. B. G. & Co. Hundred Weight*, introduced by Northrup, Braslan & Goodwin Co., is a very large cabbage of the *Flat Dutch* type, but has a tendency to form rather loose heads. The quality is good and if grown firm they are valuable.

*New Rock Head*, one of Johnson & Stokes' recent introductions, proved to be one of the surest headers in the test.

The plants are very strong, vigorous growers, with a deep root growth. The heads are large, broad, flat, very solid, and the quality is hard to excel; foliage is thick, light green with blue white bloom and covers the head. The leaves set low on the stalk leaving a short, stout stem. A variety of much promise.

*Red Drumhead*, sent out by Ferry, proved to be one of the best red varieties. The heads are medium to large, firm, of good quality and deep red in color. A marked difference between this and the other red sorts, was in the shape of the heads, which are of *Drumhead* type, while most of the other sorts are round.

*Stone Mason*, Vaughan, possesses qualities that make it a desirable sort for the gardener or home grower.

The plants are strong and develop a large per cent of heads. The heads are of good size, firm, crisp and tender, with a mild flavor; foliage thick, light green, with blue white bloom, branching low from a short, stout stem.

*Warren*, from J. J. H. Gregory & Son, is of the *Drumhead* type and proved to be very true.

The heads are deep, solid, and of fine quality; foliage light colored, tinted with purple near the edges, thick, leathery, glaucous and well lapped over the head; very few are superfluous. The stem is short, stout, holding the head erect.

#### INSECTS AND DISEASES OF THE CABBAGE.

The growing of cabbages, cauliflower and other vegetables of this family is becoming somewhat uncertain, owing to the prevalence of various insects and diseases, which attack and in many locations completely destroy them.

For several years the cabbage maggot (*Phorbia Brassicae*) has seriously affected the growth of the young plants in this vicinity, and has continued

its depredations after the plants are placed in the field. As a preventive, care should be taken that fresh soil is used for growing the plants, and that the land on which the plants are set is at some distance from that on which cabbages, onions, radishes, or turnips were grown the previous year.

A good way to combat this enemy is to mix a small quantity (a tablespoonful) of kerosene or turpentine with a peck of wood ashes and scatter over the ground near the plants; this prevents the mature insect, which is a small brown fly, from depositing its eggs upon the stems of the plants.

Kerosene emulsion and bi-sulphide of carbon have been used very successfully, and some growers advocate the placing of a circle of tarred paper around the plant, leaving it until the danger limit is passed.

The Club root, sometimes called club foot, has been for many years, a troublesome disease on the cabbage as well as on the turnip in the Eastern States and has appeared in several places in Michigan. It attacks the plants at the root and causes large swellings, which both absorb the nutriment of the plant and girdle the stem, thus checking the growth and causing it to turn yellow and die.

One strong symptom of this trouble, is the rank, disagreeable odor of decay which it gives the roots. There has been no remedy discovered for this disease, but to avoid the growing of cabbage, in succession on the same soil, and the use of the manure that contains cabbage refuse will keep it in check, and generally prevent it altogether.

In the vicinity of Racine, Wisconsin, a bacterial disease of the cabbage developed itself several years ago, and in 1896, caused heavy losses to the growers. It also injured crops in other localities.

This year it caused more trouble on the cauliflower than upon the cabbage, *Kale* or *Kohl Rabi*. The symptoms of the disease are small yellow spots, which appear on the leaves and spread over the entire surface of the leaves. The leaves droop, and a black rot soon destroys the heads.

This disease may be carried by the seed from one section to another, and when once established, the successful growing of plants of the cabbage family is nearly impossible. The destruction of all diseased plants as soon as found by burning them, seems to be the only way to hold it in check.

Cabbages are often much injured by so-called cabbage worms which feed upon the leaves, and if undisturbed may destroy the heads. They often appear early in the season before the heads have begun to form and at that time can be readily killed by the use of Paris green, or other arsenites, at the rate of one ounce to fifteen gallons of water, or with plaster or flour at the rate of one pound to one hundred. Care should be taken not to use these poisons after the heads have formed, as the danger increases as the time of ripening approaches. Should the worms appear late in the season, pyrethrum or saltpetre at the rate of a teaspoonful to a gallon of water can be used, with good results and without danger. The worm can also be destroyed by pouring hot water upon the leaves. Especially in dry seasons cabbages are often much injured by lice which may appear in immense numbers upon the leaves. As a rule, they are on the under side and in the folds of the leaves so that it is difficult to reach them with an insecticide. The prompt and thorough use of kerosene emulsion, or strong tobacco water, will aid in holding them in check, but it will be even more satisfactory to so handle the crop that the lice will not be likely to appear. When from any cause the plants are checked in their growth, we may expect the rapid development of the lice, and the danger can be lessened if land that



is not likely to suffer in time of drought is used, especially for the late varieties, and if frequent shallow cultivation is given.

### CAULIFLOWERS.

Seven varieties comprised the test in cauliflowers.

The seed and plants were handled the same as the cabbage varieties in the forcing house, and twenty-five plants of each variety were planted in the field June twenty-fifth.

*Algiers* from Henderson, produced some large, solid heads of fine quality, being tender and of mild flavor.

Salzer's *Blue Ribbon* was one of the first to mature well formed heads of good quality and seems to be worthy of further trial.

*California Wonder*, introduced by Vaughan, grew the largest plants in the test, but failed to develop heads. The hearts of the plants were a curled mass of broad, irregular leaves. Perhaps it would form heads where the season is a little longer.

*Chief*, one of Buckbee's introduction proved to be a valuable variety. It is early and grows a solid, compact crisp head on a short stalk. The leaves are numerous and have an upright growth which covers the head and protects it from the sun, thus leaving it a pure white, without being blanched by tying the leaves together, as is necessary with most of the other varieties.

*Erfurt*, sent out by Vaughan, is a standard early variety and matures good sized heads of fine quality.

*Erfurt* and *Puget Sound* sent by H. A. March, Fidalgo, Washington, proved to be much alike. They are strong growing plants and produced a much larger per cent of heads than any other sort. The heads are even and symmetrical and the quality is up to the standard. They should be classed among the best.

The same varieties of *Kale* and *Kohl Rabi* were grown as last year. The season was not as favorable for their growth but by the use of the irrigating system, equally as good plants were grown, and they were much relished by people familiar with their use.

Variety.	Seedsman.	Season.	Date.		Number of days from transplanting to maturity.	Number of plants headed.	Total weight.	Average weight.
			First mature heads.	Market maturity.				
<i>Algiers</i> .....	Henderson .....	Early.....	Aug. 30.	Sept. 15.	82	12	45.	3.75
<i>Blue Ribbon</i> .....	Salzer .....	Medium..	Sept. 10.	" 30.	97	14	45.5	3.25
<i>California Wonder</i> .....	Vaughan .....	Late.....	" .....	" .....	" .....	" .....	" .....	" .....
<i>Chief</i> .....	Buckbee .....	" .....	Sept. 25.	Oct. 10.	107	18	93.4	5.3
<i>Erfurt Dwarf</i> .....	Vaughan .....	Early.....	Aug. 25.	Sept. 15.	82	15	60	4
<i>Erfurt Large</i> .....	March .....	Late.....	Sept. 10.	Oct. 1.	98	23	128.5	5.5
<i>Puget Sound</i> .....	" .....	" .....	" 12.	" 1.	98	24	138	5.75

## SWEET CORN.

The varieties of sweet corn numbered thirty-one and included most of the new kinds sent out by different seedsmen; but the majority are standard sorts that need no description to establish their value to the truck gardener, or their usefulness in the home garden.

The seed was planted May 26, in rows three and one-half feet apart, using five kernels for each hill. The cold, wet weather that followed, made germination slow and some of the seed rotted.

TABLE OF VARIETIES.

Number.	Variety.	No. of ears per square rod.	No. days from planting to edible maturity.	Height of stalks.—Feet.	Average.		No. of rows of kernels per ear.	Length of kernels.—Inches.	Diameter of cob.—Inches.	Average weight of ears.—Ounces.
					No. of ears per stalk.	Length of ears.—Inches.				
1	Adams.....	116	73	5.	.92	7.5	12	.375	1.	6.8
2	Bonanza.....	78	97	7.	.79	8.	12	.5	1.	9.1
3	Champion.....	50	84	6.	.65	8.	12	.375	1.	7.
4	Chicago Market.....	52	75	5.	.62	7.	12	.375	1.125	5.6
5	Columbus Market.....	75	92	7.	.78	8.5	14	.375	1.25	8.
6	Concord.....	62	78	5 to 6	.52	10.	12	.375	1.	8.
7	Cory (Mammoth White).....	95	72	4.5	.88	6.5	10	.43	1.	5.6
8	Country Gentleman.....	18	105	7.5	.87	7.5	18	.5	1.	6.9
9	Dawn.....	85	92	6.5	.58	7.	14	.3125	1.125	6.8
10	Early Sugar.....	102	78	6.	.64	8.	12	.375	1.	6.4
11	Egyptian.....	87	108	6 to 8	.64	9.	12	.5	1.	8.5
12	First of All.....	38	74	4 to 5	.53	6.5	10	.375	1.	4.8
13	Fordhook.....	92	70	5.	.75	7.	8	.5	1.	4.8
14	Fottler.....	71	76	4 to 5	.61	7.5	12	.375	1.	6.4
15	Giant.....	78	81	5 to 6	.6	9.	14	.43	1.25	8.8
16	Gold Coin.....	91	108	8.	.84	9.	14	.5625	1.125	9.
17	Hance.....	135	96	7.	.55	7.5	10	.375	.875	8.
18	Honey Dew.....	71	97	8.	.61	8.	12	.3125	1.	7.
19	La Crosse.....	88	71	5.	.7	7.5	8	.375	1.	6.
20	Landreth Market.....	111	84	6 to 7	.81	8.	10	.3125	1.	6.8
21	Landreth Sugar.....	95	96	8.	.69	9.	14	.375	1.125	8.
22	Leet.....	47	80	5.	.66	8.	10	.3125	1.25	8.
23	Mammoth.....	72	106	7 to 8	.85	9.5	14	.375	4.315	9.
24	New England.....	76	78	5 to 6	.58	8.	8	.3125	.875	5.6
25	Old Colony.....	76	97	6.5	.7	8.5	16	.43	1.25	8.
26	Pee and Kay.....	71	82	6.	.68	8.5	14	.3125	1.25	8.4
27	Quincy.....	104	73	5.	.81	7.5	12	.3125	1.125	6.4
28	Roelyn.....	128	94	7.	.68	9.5	12	.3125	1.125	7.1
29	Ruby.....	85	97	7.	.59	9.0	14	.3125	1.125	8.
30	Stowell.....	71	92	7.	.71	10.	16	.625	1.	8.5
31	Twenty Day.....	14	70	4.	.3	6.5	8	.3125	1.	5.6

The three varieties sent out by A. W. Livingston's Sons of Columbus, Ohio, proved to be particularly promising.

*Columbus Market*, grows a strong stalk well covered with long, broad foliage. The ears are symmetrical, maturing about the season of Stowell, and equal it in quality.

*Giant*, proved to be a very large early corn; ears of good length and well filled with broad kernels of large size and high quality.

*Hance*, a variety medium in season, developed some valuable points. It is a good grower, producing long ears; cob small, well covered with broad, white kernels, rich in sugar.

*Twenty Day*, a dwarf variety, sent out as a novelty by Salzer, matured the first ears, but they were very small and much injured by smut. Judging from this year's test, it seems valueless.

The standard sorts of sweet corn can be grouped into five classes, viz.: Extra Early, Early, Medium Early, Medium Late, and Late.

In the class of Extra Early varieties, can be placed *Fordhook*, *LaCrosse*, *Cory* (*Mam. White*), *Adams*, *Quincy*, and *First of All*, which mature in the order named. Each variety possesses qualities that make it of value, under certain special conditions.

In the "Early" class are *Chicago Market*, *Fottler*, *Concord* and *New England*, all of which are standard varieties.

The "Medium Early" group includes the first true sugar varieties, such as: *Leet*, *Giant*, *Pee and Kay*, *Champion*, *Landreth's Market* and *Columbus Market*, which together with those ripening a little later, such as *Stowell*, *Roslyn*, *Hance*, *Landreth Sugar*, *Honey Dew*, and *Ruby*, extend the season until the large late varieties ripen.

Among the "Late" varieties, are: *Egyptian*, *Gold Coin* and *Mammoth*, which produce ears of large size, but are of no better quality than some of the "Medium Late" sorts. *Country Gentleman* is a late maturing kind, of medium size and superior quality, making it one of the best varieties for home use.

## PEAS, 1897.

## LIST OF VARIETIES.

Number.	Variety.	Seedsman.	Per cent. grew.	Date.		No. of days from planting to edible maturity.	Length of edible maturity.—Days.	No. of peas in each pod.	Per cent of peas to total weight.
				First bloom.	Edible maturity.				
1	Advancer .....	Ferry .....	65	June 14	June 28	51	8	5-7	55
2	Alaska .....	" .....	70	" 12	" 28	53	8	4-8	51
3	Alpha .....	" .....	75	" 12	July 1	56	7	2-5	49
4	American Wonder .....	" .....	70	" 14	" 1	56	9	5-8	45
5	Asparagus .....	Burpee .....	65	July 1	" 22	77	7	5-12	28
6	Charmer .....	Vick .....	85	June 23	" 6	61	8	5-8	49
7	Champion of England .....	Ferry .....	95	" 24	" 4	59	10	6-7	52
8	Daisy .....	Burpee .....	85	" 22	" 5	60	10	4-7	48
9	Eclipse .....	Vaughan .....	85	" 12	June 29	54	7	4-7	51
10	Epicure's Delight .....	Salzer .....	95	" 17	July 4	59	8	5-9	35
11	First and Best .....	Ferry .....	90	" 12	June 24	49	6	5-7	52
12	Grant's Favorite .....	Burpee .....	90	July 1	July 16	71	12	5-7	51
13	Morning Star .....	Childs .....	90	June 13	June 28	53	8	4-8	45
14	Nott's Excelsior .....	Ferry .....	90	" 17	July 1	56	9	4-7	34
15	Orion .....	Leonard .....	80	" 22	" 5	60	8	4-7	38
16	Prolific .....	Livingston .....	95	" 26	" 10	65	7	4-8	48
17	Scorchers .....	Salzer .....	90	" 11	June 30	55	7	4-6	50
18	Startler .....	Buckbee .....	*						
19	Stratagem .....	Ferry .....	50	" 29	July 16	71	8	5-8	45
20	Surprise .....	Gregory .....	75	" 20	" 1	49	7	4-7	46
21	Tall Grey Sugar .....	Vaughan .....	85	July 1	" 22	77	9	5-8	50
22	Telephone .....	" .....	45	June 28	" 7	62	5	3-10	32

\* Failed to grow.

The test of peas for 1897, was confined to the novelties and new varieties, together with some of the standard sorts for comparison. The plot selected was on the south side of the vegetable garden, directly west of the standpipe.

The seed was sown Wednesday, May 5, two inches apart in double drills about four inches deep, using twelve feet for each variety. The conditions of the soil and weather were such that a large per cent grew. The rains during the early part of the season were sufficient to promote a strong growth of vines, well set with pods; but the extremely hot weather the last of June and first of July, would have shortened the crops and seriously affected the yield, had not water been applied by our irrigating system, which greatly increased the length of the edible period.

The standard varieties noted are used as representative types of the different classes with which to compare the new sorts.

**CLASS I.**—Plants tall, averaging three to four feet, seeds white or cream colored; pods edible.

*Tall Grey Sugar*, sent out by Vaughan, was the sole representative of this class; a very tall growing variety with strong rank vines, very spreading. The pods are long, broad, very tender and sweet; used the same as string beans. The peas are large, plump, very tender, and rich flavored. If this variety was more prolific, it would be a desirable sort.

**CLASS II.**—Plants tall, averaging three to four feet; curved pods, white or cream colored seeds.

*Champion of England*, one of the older sorts, can be taken as a true standard for this class, as it is one of the best varieties for the home or market garden.

The additions to this class are:

*Morning Star*, from Childs, a tall growing variety, with very fine, branching vines; quite productive, pods well filled, with plump sweet peas of fine texture.

*Prolific*, sent out by Livingston, is an exceedingly strong grower and very productive, but seemed to be rather susceptible to mildew, as it was one of the two varieties that showed traces of it. The pods are long, broad, irregular in shape, and filled with peas of high quality. The blossoms are of a pink color and make it quite attractive. It promises to be of value as a late variety.

*Surprise*, from Gregory, seemed to be quite typical of its name as, sowed one week later than the other varieties, it made a very rapid growth and reached maturity sooner than several of the smaller sorts.

The vines are very slender and branching, and it dries quickly in hot weather, which shortens its edible period. The pods are regular in form, of good size, and are filled with tender, sugary peas.

*Telephone*, also belongs to this class, but it is an old variety much like *Champion of England*, except being a few days earlier and of shorter edible maturity.

*Charmer*, a new variety sent out by Vick. The plants are from three to five feet high, with light colored foliage; lacking in productiveness. Pods are long, slim, slightly curved, pointed at the apex, and fairly well filled with plump, sweet peas.

*Grant's Favorite*.—Introduced by Burpee.

The vines are tall, rank growers, with dense, dark colored foliage, not easily affected by dry weather. Stipules short, pods long, broad, nearly straight, blunt at the apex, and well filled with peas. The peas are plump, tender, and very rich in flavor.

This promises to be of especial value for the home garden, as the length

of edible maturity is much prolonged by the vines still continuing to bloom when the first pods are edible.

**CLASS III.**—Half dwarf varieties, two to four feet high. Peas smooth or indented; white or cream; pods straight or nearly so. *Stratagem* will represent this class.

*Alpha*, from D. M. Ferry & Co., grew rather spindling vines that seemed to be rather easily affected by dry weather.

The pods were numerous, of good size and shape, but not well filled. The peas were fair size, plump, tender, and contained a medium amount of sugar.

*Eclipse*, introduced by Vaughan.

Vines are strong, of medium size, and well covered with dark-colored foliage. Pods are short, plump, and very even, nearly all maturing at once. Peas round, plump, tender and sweet.

*Epicure's Delight*, introduced by Salzer. A very quick growing variety, with medium-sized vines.

The vines are dark green in color, appear to be strong and hardy and produce a large amount of broad pods, tapering from the stipules to about the center, and blunt at the apex. Peas large, of irregular round shape, sweet and tender.

*Orion* grew medium sized, light colored vines well set with pods that contained comparatively few peas. The pods were pointed at both base and apex and contained a few peas of medium quality.

**CLASS IV.**—Vines dwarf; seeds green, bluish green, white or cream colored; seeds shriveled; pods straight or nearly so.

*First and Best* from Ferry, was the first to reach edible maturity. The vines were of medium size, strong growers, but began to die as soon as the peas reached edible maturity, thus shortening the length of their usefulness. Pods are plump, regular shape and well filled with large peas that seem to have a rather tough skin; flavor good. A good early variety, which can be taken as the type of this class.

*Scorcher*, received from Salzer, is an early quick grower, with straight pods of good size, well filled with peas of high quality. The vines are of medium size, branch close to the ground, and the well-filled pods are borne abundantly. Peas are of medium size, tender, and of good quality for an extra early variety.

#### POTATOES, 1897.

The experimental plot for potatoes was located on the north side of the garden; a part of it was used for potatoes in 1896, the balance being a turned under strawberry bed.

The soil is rather diversified, ranging from a black loam, mixed with quicksand to a light sand with a clay subsoil, but the plots were so arranged that the test was a fair one. Although the seed was treated with corrosive sublimate solution (1-2000), the crop of tubers showed more scab than last year, especially on the portion where potatoes had been previously grown. The weather furnished the proper conditions for the development of the scab germs, and had the seed not been thoroughly disinfected the loss would probably have been much greater.

A heavy coating of finely composted manure was plowed under in the fall and the land was replowed in the spring and finely pulverized with the Acme harrow and rolled, which placed the soil in a fine tilth for the young plants.

TABLES OF VARIETIES.—Plot Planted May 11.

Variety.	Date of maturity.		Yield per acre, bushels.			Average yield for 1896, 1897.	General average.	No. of years averaged.
	Edible.	Market.	Large.	Small.	Total.			
Aerne.....	Aug. 5	Aug. 25	114.03	15.55	129.58	146.42	146.42	2
Algoma.....	" 1	" 25	62.2	36.28	98.30	176.52	176.52	1
Belle.....	" 25	Sept. 14	150.31	31.1	181.41	176.52	176.52	2
Blush.....	" 28	" 2	62.2	31.1	93.3	146.39	185.76	1
Bovee (Dep't).....	" 24	" 2	119.21	46.25	165.86	146.39	185.76	3
Bovee (Hend.).....	" 24	" 6	93.3	36.28	129.58	130.87	183.75	1
Freeman.....	" 20	" 10	119.21	20.73	139.94	124.41	186.3	7
Hicks' 81.....	" 20	" 1	77.75	31.1	108.85	124.41	186.3	6
Honeye Rose (Dep't).....	" 18	" 2	101.07	25.91	126.98	107.54	186.3	2
Irish Cobbler.....	" 5	Aug. 25	196.96	41.46	238.42	223.67	186.3	2
June Eating.....	" 20	Sept. 12	129.58	20.73	150.31	126.98	186.3	3
Kansas.....	Sept. 1	" 14	134.76	25.91	160.67	82.97	123.46	1
King of the Earlies.....	Aug. 1	Aug. 20	67.38	10.36	77.74	82.97	123.46	3
Michigan.....	" 20	Sept. 1	108.85	31.1	139.95	184.41	186.3	2
Norther.....	" 25	" 8	124.4	38.87	163.27	178.02	186.3	2
Peachblow.....	" 20	" 10	142.54	20.73	163.27	151.6	212.33	3
Pinkeye (Dep't).....	" 22	" 4	132.17	20.73	152.90	155.49	212.33	2
Pinkeye (Road).....	" 27	" 8	67.38	31.1	98.48	149.01	212.33	1
Pride.....	" 18	" 6	82.93	38.87	121.80	149.01	212.33	2
Quick Crop.....	" 22	" 5	62.2	31.1	93.3	126.43	212.33	2
Read's 86.....	" 24	" 5	57.1	31.1	88.11	114.02	129.85	3
Six Weeks.....	" 16	" 1	137.35	20.73	158.08	114.02	129.85	1
Snowball.....	" 28	" 10	108.66	23.82	126.98	114.02	129.85	1
Thoroughbred.....	" 10	" 6	67.38	31.1	98.48	115.33	129.85	2
Trumbull.....	" 18	" 4	49.24	36.28	85.52	115.33	129.85	1
Vaughan.....	" 14	Aug. 30	106.25	33.69	106.85	103.16	133.05	5
White Lily.....	" 16	Sept. 10	93.3	18.14	111.44	104.96	133.05	3
White Ohio.....	" 1	Aug. 15	57.01	23.32	80.33	104.96	133.05	1
Woodbury.....	Sept. 1	Sept. 16	93.3	51.83	145.13	168.45	133.05	2
Woodhall.....	Aug. 20	" 8	209.92	31.1	241.02	126.98	133.05	1
2413.....	" 1	Aug. 20	57.01	15.55	72.56	126.98	133.05	2

Plot Planted June 4.

Variety.	Date of maturity.		Yield per acre, bushels.			Average yield for 1896, 1897.	General average.	No. of years averaged.
	Edible.	Market.	Large.	Small.	Total.			
Abundance.....	Sept. 5	Sept. 16	129.58	31.1	160.68	222.88	188.8	2
Accidental.....	" 4	" 16	176.22	25.9	202.72	207.31	188.8	1
Adirondac.....	" 12	" 17	165.86	20.73	186.59	176.21	188.8	2
Alexander Prolific.....	" 10	" 17	72.56	5.18	77.74	207.31	188.8	2
American Beauty.....	" 10	" 17	67.38	10.36	77.74	186.58	188.8	2
American Wonder.....	" 6	" 14	77.75	25.91	103.66	69.96	184.43	6
Andes.....	Aug. 20	" 1	59.6	15.55	75.15	111.43	114.04	1
Arizona.....	Sept. 15	" 17	67.38	41.46	108.84	108.84	188.8	1
Battle's Best.....	" 10	" 17	134.76	15.55	150.31	124.39	188.8	1
Beauty of Beauties.....	" 12	" 17	155.5	10.36	165.86	165.86	188.8	1
Blush.....	" 10	" 17	93.3	36.28	129.58	111.43	114.04	1
Brack's Chance.....	" 6	" 15	57.01	15.55	72.56	111.43	114.04	3
Bristol Beauty.....	" 18	" 17	67.38	23.32	90.7	124.39	188.8	1
Burr No. 1.....	" 12	" 17	98.48	25.91	124.39	124.39	188.8	1
Carman No. 1.....	" 10	" 17	165.86	23.32	189.18	163.36	188.8	4
Carman No. 3.....	" 10	" 17	147.72	20.73	168.45	247.49	258.41	3
Cayuga.....	" 8	" 16	106.25	28.5	134.76	300.41	207.7	6
Champion of the World.....	" 3	" 12	62.2	18.14	80.34	265.64	207.7	2
Clarendon Beauty.....	" 8	" 16	67.38	10.36	77.74	265.64	207.7	1

Plot Planted June 4.—Concluded.

Variety.	Date of maturity		Yield per acre, bushels.			Average yield <sup>1</sup> for 1886, 1887.	General average.	No. of years averaged.
	Edible.	Market.	Large.	Small.	Total.			
Columbus.....	Sept. 10	Sept. 17	124.4	33.69	158.09	—	—	1
Endurance.....	" 12	" 17	57.01	12.95	69.96	—	—	1
Enormous.....	" 12	" 17	165.86	2.59	168.45	353.75	—	2
Fillbasket.....	" 6	" 14	82.93	5.18	88.11	165.86	184.28	6
Flagle.....	" 4	" 12	67.38	15.55	82.93	176.23	—	2
Fottler's Peachblow.....	" 12	" 17	88.11	25.91	114.03	236.97	—	2
General Purpose.....	" 8	" 14	103.66	18.14	121.8	221.58	—	2
Good Times.....	" 8	" 15	134.76	41.46	176.22	—	—	1
Harrington Peer.....	" 1	" 16	239.16	41.46	300.62	—	—	1
Harvest Queen.....	" 4	" 10	77.75	38.87	116.62	229.36	—	2
Hicks 22.....	" 8	" 14	88.11	7.77	95.88	281.18	228.88	6
Hicks 101.....	" 10	" 17	145.13	23.82	168.95	272.11	243.7	6
Honey Rose.....	" 6	" 14	98.48	15.55	114.03	101.07	—	2
Irish Mignon.....	" 10	" 17	77.75	10.36	88.11	—	—	1
Joseph.....	" 6	" 14	57.01	41.46	98.47	—	—	1
King of the Roses.....	" 4	" 14	72.56	15.55	88.11	124.49	—	2
Klondyke.....	" 8	" 14	165.86	46.65	212.51	—	—	1
Leonard.....	" 6	" 14	51.83	41.46	103.66	—	—	1
Lightning Express.....	" 1	" 10	88.11	25.91	114.02	141.23	179.74	4
Lincoln.....	" 6	" 15	114.02	46.65	160.67	—	—	1
Livingston Banner.....	" 8	" 15	121.8	23.32	145.12	286.37	—	2
Long Keeper.....	" 15	" 17	134.76	25.91	160.67	—	—	1
Maggie Murphy (Department)	" 12	" 17	103.66	10.36	114.02	261.74	—	2
(Brown).....	" 12	" 17	155.5	10.36	165.86	—	—	1
Michigan Beauty.....	" 8	" 15	25.91	18.14	44.05	81.64	—	2
Mill's Banner.....	" 8	" 15	207.33	25.91	233.24	—	—	1
" Prize (Butcher).....	" 12	" 17	137.35	15.55	152.9	—	—	1
Milwaukee.....	" 6	" 14	103.66	36.28	139.94	124.39	168.86	4
Napoleon.....	" 12	" 17	67.38	28.5	95.89	268.05	—	2
O. K. Mammoth.....	" 6	" 14	67.38	15.55	82.93	199.55	196.76	7
On Top.....	" 8	" 14	77.75	25.91	103.66	248.40	174.21	6
Onward.....	" 4	" 12	72.56	23.82	95.88	—	—	1
Orphan.....	" 1	" 10	103.66	15.55	124.4	139.46	203.97	3
Paddleford.....	" 10	" 17	103.66	44.05	147.71	—	—	1
Peachblow.....	" 14	" 17	103.66	25.91	129.57	282.48	—	2
Perfection.....	" 2	" 10	119.21	31.1	150.31	—	—	1
Planet Jr.....	" 10	" 17	145.13	20.73	165.86	—	—	1
Pride of Seneca.....	" 6	" 14	103.66	31.1	134.76	—	—	1
Queen of Paris.....	" 6	" 14	51.83	15.55	67.38	218.99	220.09	7
Queen of the Valley.....	" 8	" 16	75.15	12.95	88.1	—	—	1
Read's 99.....	" 10	" 17	114.03	20.73	134.76	—	—	1
Rose No. 9.....	" 4	" 12	57.01	25.91	82.92	132.16	—	2
Rose of Erin.....	" 6	" 12	93.3	28.5	121.8	—	—	1
Rose Standish.....	" 4	" 12	98.48	31.1	129.58	152.9	—	2
Rural New Yorker No. 2.....	" 8	" 14	129.58	31.1	160.68	321.36	191.74	8
Rutland Rose.....	" 6	" 14	98.48	15.55	114.03	256.57	—	2
Seedling No. 2 (Teeter).....	" 8	" 17	57.01	15.55	72.56	—	—	1
Sir Walter Raleigh.....	" 8	" 14	134.76	18.14	152.9	—	—	1
Snowflake Jr.....	" 1	" 10	114.03	20.73	134.76	145.12	—	2
Suffolk Beauty.....	" 4	" 14	114.03	28.5	142.53	—	—	1
Table King.....	" 2	" 10	36.28	20.73	57.01	108.84	—	2
Uncle Sam.....	" 1	" 9	150.31	25.91	176.22	152.89	—	2
Unknown.....	" 10	" 17	72.56	15.55	88.11	95.85	—	2
Vanguard.....	" 2	" 12	77.75	10.36	88.11	243.61	221.43	4
Victor Rose.....	" 10	" 17	64.74	10.36	75.1	143.8	177.02	4
Vigorosa.....	" 1	" 10	129.58	36.28	165.86	144.12	—	2
White Gem.....	" 2	" 10	57.01	15.55	72.56	196.96	227.97	3
" Peachblow.....	" 14	" 17	93.3	25.91	119.21	—	—	1

The early plot was marked May 11, with furrows forty-two inches apart, and each variety was given a forty-foot space in the row; two pounds of seed of each variety were cut into twenty-five pieces, which were dropped by hand about eighteen inches apart, and covered to the depth of four inches. After planting, the ground was rolled, and as soon as the small weeds began to start, Breed's weeder was used at intervals of three to four days, thus keeping the surface loose and aiding in preventing evaporation as well as keeping the weeds down. This method of cultivation was kept up until the plants reached a height of from six to seven inches, after which the Planet Jr. cultivator was used weekly, or after each rain until the vines covered the ground. At all times shallow, level cultivation was given.

The late varieties were planted June 4, and cultivated in the same manner. Among the potatoes received from the different seedsmen were several varieties, the season of which was not known, and for comparison the seed was divided equally between the two plantings.

The tables show the results obtained.

The new varieties grown in the test this year were obtained from the following parties:

E. Tully, Penza, Ohio.—*Trumbull*; H. C. Marsh, Muncie, Ind.—*Andes*; Peter Henderson & Co., 35-37 Cortland St., N. Y.—*Uncle Sam*, *Bovee*, and *Sir Walter Raleigh*; D. M. Teeter, Bellaire, Ohio.—*Seedling No. 2*; F. Barteldes & Co., Lawrence, Kan.—*Kansas*; S. F. Leonard, Chicago, Ill.—*Leonard*; J. M. Thorburn & Co., N. Y.—*White Peachblow*; Wm. Henry Maule, Philadelphia, Pa.—*Beauty of Beauties*; Jas. Vick's Sons, Rochester, N. Y.—*White Ohio* and *Vick's Perfection*; L. L. Olds, Clinton, Wis.—*Joseph*; F. B. Mills, Rose Hill, N. Y.—*Mills' Banner*, *Irish Mignon*, and *Long Keeper*; Frank Ford & Sons, Ravenna, Ohio.—*Lincoln* and *Columbus*; Geo. W. P. Jerrard Co., Caribou, Me.—*Stray Beauty*; E. J. Smith, Paddleford, N. Y.—*Smith's Six Weeks*, *Burrs No. 1*, *Paddleford*, John A. Salzer, La Crosse, Wis.—*Good Times*; C. C. Brawley, New Madison, Ohio.—*Endurance*, *Algoma*, *Arizona*, *Queen of the Valley* and *Onward*; T. H. Glover, Mancelona, Mich.—*Harrington's Peer*; B. W. Steere, Carthage, Ind.—*Accidental*; E. W. Butcher, Albion, Mich.—*Mills' Prize*; Galusha D. Oathout, Wolcott, N. Y.—*Clarendon Beauty*; R. H. Brown & Co., Victor, N. Y.—*Blush*, *Honeye Rose*, *Planet Jr.*, *Maggie Murphy*, *Rose of Erin*, *Pride of Seneca*, *Woodhull*; Wm. Myers, Mears, Mich.—*Klondyke*; Dison J. Porter, Three Rivers, Mich.—*Battles' Best*; F. W. Read, Grand Rapids, Wis.—*Early Snowball*, *Early Pinkeye*, *Bristol Beauty*, *Suffolk Beauty*, *Read's 99*.

#### SUMMARY.

The new varieties that promise to become standard sorts, are found in the following lists.

##### *Early Varieties.*

Among the varieties maturing first, *Irish Cobbler* (238.42 bu.) takes the lead and increases its yield of last year. *Six Weeks* (158.08 bu.), *Algoma* (98.30 bu.) and *White Ohio* (80.33 bu.) are very promising extra early sorts.

##### *Medium.*

The medium sorts gave the largest yields this year. *Harrington's Peer* planted June 4, was mature September 1, and yielded (300.62 bu.) per acre,



*Woodhull* (241.02 bu.), *Accidental* (202.51 bu.), *Uncle Sam* (176.22 bu.) and *Klondyke* (212.12 bu.) gave nearly as good results and are excellent in quality.

#### LATE VARIETIES.

Frost killed the vines September 17, and though it did not affect the edible qualities of the tubers, it checked the growth of the late sorts and is a partial cause of the small yield. *Mills' Banner* (233.24 bu.), *Good Times* (176.22 bu.), *Planet Jr.* (165.86 bu.) and *Sir Walter Raleigh* (152.9 bu.) were among the large yielders among the new varieties, but others of less recent introduction, including *Carman No. 1*, (189.19 bu.), *Carman No. 3* (168.45 bu.), *Encarnus* (168.45 bu.), *Rural N. Y. No. 2* (160.68 bu.), *Peachblow* (129.57 bu.), *Livingston Banner* (145.12 bu.) and *Beauty of Beauties* (165.86 bu.) are productive and good keepers.

#### NEW VARIETIES.

*Accidental*.—A medium early variety of excellent quality and quite productive. Tubers, medium to large; shape irregular, oblong; eyes numerous, evenly distributed, long, narrow, slightly sunken, and strong sprout centers; skin smooth, netted in patches, rose tinted; flesh cream white, firm, dry and fine grained. Vine stout, spreading, rather long.

*Algoma*.—A new variety of the Hebron class originated in Minnesota, that is worthy of further trial; size medium; shape oblong and a little flattened, with broad, open, shallow eyes, located mostly on the seed end; lip well marked but not prominent, skin white, smooth, with slight traces of russet; flesh firm, of good texture, dry; fairly productive. Vines short, spreading, stems green. A variety that possesses superior qualities and promises to be a valuable early home or market sort.

*Andes*.—Size medium to large; shape ovate to oblong; eyes numerous, narrow, pinkish, rather shallow, evenly distributed over the entire surface; skin delicate light pink with russet appearance; flesh firm, white, fine grained, very dry. Vines upright, rather short. It was grown under unfavorable conditions and gave only a small yield. Said to be a productive early sort.

*Arizona*.—One of the Rose type with strong, vigorous vines. Tubers small to medium, oblong, irregularly flattened; eyes numerous, of medium depth; broad, with well marked lip, having a slight protuberance from the middle of the curve; skin netted, thin, white; flesh white, firm, of fine texture and dry. Vines spreading, rather long. Season medium; yield rather small. Will be given further trial.

*Battles' Best*.—The tubers are medium to large; shape round, slightly flattened; eyes numerous, broad, shallow, cream-tinted, well scattered over the surface; skin cream-tinted, russet and thin; flesh coarse, irregularly veined, whitish, firm but a little watery. It would probably have been more productive had it matured before the frost killed the vines. Vines tall, slender, nearly upright.

*Beauty of Beauties*.—A new variety with promising characteristics. Season medium to late; quite productive. Size medium; shape ovate to oblong, flattened; eyes broad, shallow, white; lip not prominent though well marked; skin pale pink, slightly netted; flesh white, fine grained, rather soft and watery. Vines quite tall, strong, upright. Owing to its handsome appearance it will be included in the list for further trial.

**Blush.**—A medium late variety with strong, rank growing vines. Size, medium to large, round to oblong; eyes small and shallow, well distributed; sprout center strong and pink in color; skin pink, netted; flesh white, dry, firm, fine texture. Stems dark green, spreading, medium length. Productiveness above the average. This variety has the markings of a fine potato and will be carefully watched in the future.

**Bristol Beauty.**—A variety introduced from Wisconsin. Tubers rather small, oblong, regularly flattened; eyes long, shallow with a well marked sharp lip, pink in color; skin pinkish white, slightly russeted; flesh veined through the center, firm, fine texture, dry. Season medium, somewhat lacking in productiveness. Stems rather long, spreading.

**Burr No. 1.**—This variety possesses characteristics, that in many localities will make it a desirable sort. It is of good size, fine quality and productive, as well as a good keeper. Stems rather short, spreading.

**Clarendon Beauty.**—A new variety originated in Clarendon, Orleans County, N. Y. Tubers medium size, oval, flattened; eyes long, broad, open, shallow; color pinkish white with a strong sprout center; skin rose-tinted, finely netted; flesh white, firm, fine grained and dry. Stem tall, nearly erect. Season medium late; lacking in productiveness. Seems to be worthy of further trial as it is quite attractive and possesses some superior qualities.

**Columbus.**—A variety with strong rank vines, not seriously affected by dry weather. Tubers medium to large, ovate to oblong in shape; eyes broad, near the surface, slightly pink-tinted; lip well marked; skin pinkish white, thin, coarsely netted; flesh cream white, firm, fine grained, dry. Season late and quite productive. This variety is largely advertised and will be given further trial. Rather tall, medium, spreading.

**Endurance.**—A late variety that in many localities would not mature. Tubers of medium size, round, oblong; eyes numerous, near the surface; skin slightly rusty, cream white, thin; flesh very white, fine grained, firm, but a little watery. Rather tall, upright. It is a well formed potato and if sufficiently productive will be desirable as a late keeping variety.

**Good Times.**—Closely resembles *Champion of the World*. The potatoes are medium to large in size; shape oval, slightly flattened; eyes broad, very shallow, slightly lipped and of a delicate pink color; skin finely netted, very thin and pinkish white; flesh firm, of good texture, white and dry. Rather tall, upright, somewhat spreading. A medium late sort that appears to be quite productive. This promises to be a valuable, general purpose potato, as it possesses many points of merit.

**Harrington Peer.**—A variety that exceeded all others in productiveness. Tubers medium to large, oblong, flattened; eyes numerous, broad and shallow, with a sharp but not prominent lip; skin light pink or rose color, smooth and slightly netted; flesh white, fine grained, firm and dry. It is said to be a seedling of Early Rose, and will take its place on the market, being equal to it in appearance, quality, etc., and promises to be a better yielder. Vines strong, quite tall and upright.

**Honeye Rose.**—A fairly productive medium early variety, which possesses points that will make it one of the leaders in the Rose class. The potatoes are of good size, desirable in form and high quality. Stems of medium height, upright, green.

**Irish Mignon.**—Tubers small to medium, round; eyes slightly sunken, narrow and small, pink tinted; skin cream color, thickly covered with russet; flesh creamy white, firm and dry. Vines of medium height, slender,

spreading. Season very late; fairly productive. For growers who prefer a round potato this seems to be a promising late sort.

*Joseph*.—Originated by the introducer of the old variety *Polaris*. It equals it in quality and excels it in yield. The vines are strong growers; tubers medium to large, slightly flattened; eyes prominent, deeply indented and with a strong lip; skin cream white with slight russet patches; flesh white, firm, of fine texture. Rather tall, spreading. Season medium; fairly productive. Admirers of *Polaris* should add this sort to their list.

*Kansas*.—A variety strongly resembling Ohio, but it is more productive and matures about two weeks later. Tubers large, irregular, round oblong in shape; eyes numerous, evenly distributed, rather deep and with a purple tint; skin fine russet, rather thick; flesh firm, creamy white, a little coarse, rather watery. Stems green, spreading, medium height. Season medium early and quite productive.

*Klondyke*.—A white potato worthy of trial. Size medium to large; oblong flattened; eyes shallow, narrow and scattering; skin cream white, slightly russet, finely netted; flesh very white, firm, fine and dry. Season medium. It was one of the largest yielders and this with its other valuable characteristics should make it one of the leading varieties.

*Leonard*.—Quite productive and a little earlier than Rural New Yorker No. 2, which it resembles in appearance, except that it is less flattened. Tubers of medium size, oblong, slightly flattened; eyes shallow, with a rather indistinct lip; skin pinkish white, finely netted; flesh white, firm, of medium grain, dry. Vines spreading, medium height. Its only superiority over the Rural is that it is less apt to be hollow. It is medium early and appears lacking in productiveness.

*Lincoln*.—The original seed of this potato was brought from Norway, where it was considered one of the best varieties. It seems to have lost none of its good qualities. The tubers are of medium size, oblong, flattened, with small, rather deeply sunken eyes; lip sharp and well marked; skin white with faint pink patches scattered irregularly over the surface; flesh white, of fine texture, firm but a little watery, which would probably disappear later in the season. Season medium, quite productive. Stems tall, nearly upright.

*Long Keeper*.—Vines very strong, rank growers; tubers small to medium, irregular in shape, the majority being round to oval and flattened; eyes numerous, very red, situated mostly at the seed end, broad and rather deep; skin covered with many dots, cream white; flesh white, firm, fine grained. Quite late and productive. Strong, tall, rather spreading. Judging from its firmness it promises to be true to its name as a keeper.

*Mills' Banner*.—Similar to *Livingston's Banner* and possesses qualities that make it an acquisition to a potato grower's list. Season late and one of the most productive varieties grown. Rather long, spreading vines.

*Mills' Prize*.—Shows no superiority over *Prize* grown here for the past two years. Quite late and fairly productive. The tubers are of good size, of desirable form and excellent in quality.

*Onward*.—A new variety which resembles *Great Divide* in color, shape and time of ripening. The tubers are of medium size, oval to oblong in shape; eyes small, shallow, cream white; lip distinct; skin smooth with finely netted spots, a delicate white cream color; flesh firm, fine grained, white, rather watery. Stems of medium height, spreading. Owing to its smoothness and other desirable qualities, it is likely to become one of the standard late sorts.

*Paddleford*.—A new late variety originated at Paddleford, N. Y. Tubers rather small, ovate to oblong in shape, with small eyes; skin pinkish white; flesh dry, brittle, fine grained, firm and white. Stems tall, strong and upright. It seems to have the essentials of a good potato, and is fairly productive.

*Perfection*.—A medium variety that, owing to its productiveness and fine appearance, together with its superior quality, is bound to be a valuable general purpose sort. Tubers large, oblong, slightly flattened; eyes prominent, but near the surface, slightly pink tinted; skin cream white with traces of pink coloring; flesh very white, of fine texture, dry. Fairly productive. Rather long spreading vines.

*Planet, Jr.*—One of the largest yielders among the recent introductions. Tubers medium to large, oblong, slightly flattened; eyes numerous, slightly raised and evenly distributed over the surface; skin finely netted, delicately pink tinted; flesh white, fine grained, firm and dry. Very few late varieties promise to be superior to this. Vines medium length, low and spreading.

*Pride of Seneca*.—A potato with many strong points. Medium to large in size, oblong, flattened; eyes numerous, slightly raised, broad, very strong, slightly pink in the center; skin netted, reddish-pink; flesh very firm, fine grained and dry. Season medium; fairly productive. Stem of medium length and size, spreading.

*Queen of the Valley*.—A variety so closely resembling *Maggie Murphy* that it is difficult to distinguish them. In fact, *Maggie Murphy*, as grown here, produced tubers that seemed identical with *Queen of the Valley*. Vines tall and strong. Both are valuable sorts, being, as a rule, productive and of fair quality.

*Read's Ninety-nine*.—An attractive white potato of medium size, oblong, slightly flattened; eyes broad, shallow, very pink; skin cream white, smooth, with slight russet markings; flesh firm, white, fine grained, and dry. It seems to be productive and of excellent quality.

*Rose of Erin*.—Largely advertised as a desirable general purpose potato. Tubers medium to large, oblong to ovate, flattened; eyes numerous, evenly distributed, narrow and deeply sunken, partly closed with a prominent lip; skin finely netted, pink, very thin; flesh white, rather coarse, but firm and dry. Vines of medium length, spreading. Season medium; rather low in productiveness.

*Seedling No. 2. (Teeter.)*—A new variety of handsome appearance but lacking in productiveness. Of large size, oblong, flattened in form; eyes shallow, scattering, broad and very strong; skin pure white, finely netted; flesh white, firm texture and very dry. Vines of medium length, low and spreading.

*Sir Walter Raleigh*.—A seedling of *Rural New Yorker*, which promises to excel its parent, as it seems to be firmer, and less liable to become hollow. Rather tall and upright. The size and shape are very desirable, its quality excellent, and it will take its place on the market as a medium late white potato.

*Six Weeks. (Smith.)*—A medium early sort of good quality, somewhat resembling Hebron. It is productive on trial as a garden or field variety. Vines of medium height, spreading, green.

*Snowball*.—A medium early variety, which possesses some very desirable qualities, but it is rather small and appears to be slightly watery.

Stems low, green and spreading. The tubers are very attractive and it will be grown again next year.

*Suffolk Beauty*.—One of the Rose class. Medium in size, of irregular, oblong shape with numerous deep pink eyes; skin pink, finely netted and filled with small, light dots; flesh pure white with slight traces of pink veins running through it. Season medium; fairly productive. Vines of medium height, spreading.

*Trumbull*.—A medium early sort that is of fine quality though hardly up to the standard in productiveness. The tubers are of medium size, oblong, flattened, with shallow, open eyes; skin clear white, a little netted, and the surface speckled with numerous small white dots. The texture and flavor are of high quality. Vines of medium height, spreading, green.

*Uncle Sam*.—One of the white varieties introduced in 1896. It is of excellent quality and of handsome appearance; although not satisfactory in productiveness last year, it has made a good showing the present season. Vines strong, vigorous, spreading.

*Woodhull*.—One of the varieties that was planted at different dates proved itself to be a very valuable medium early sort. Tubers white, of fine shape, excellent quality and quite productive. Rather tall, green, spreading stems.

*White Peach Blow*.—A seedling of the *Excelsior*, closely resembling the old *Peach Blow*, but being earlier in ripening, it is even more desirable. The skin and flesh are of floury whiteness; eyes strong, broad, of medium depth. It is a very strong, upright, rank grower with large pink blossoms and may take the place once held by *Peach Blow*.

L. R. TAFT,  
H. P. GLADDEN,  
M. L. DEAN.

AGRICULTURAL COLLEGE, MICH.,

January 1, 1898.

**BULLETIN 154**

**MARCH, 1898**

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# **EXPERIMENT STATION**

**FARM DEPARTMENT**

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## **SOME EXPERIMENTS IN CORN RAISING**

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**By C. D. SMITH, Director**

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**AGRICULTURAL COLLEGE, MICHIGAN  
1898**

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I. H. BUTTERFIELD,

MICHIGAN  
STATE AGRICULTURAL COLLEGE  
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SOME EXPERIMENTS IN CORN RAISING

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AGRICULTURAL COLLEGE, MICHIGAN  
1898



The *Bulletins* of this Station are sent free to all newspapers in the State and to such individuals interested in farming as may request them. Address all applications to the Secretary, Agricultural College, Michigan.

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## SUB-STATIONS

Grayling, Crawford County, 80 acres deeded.  
 South Haven, Van Buren County, 10 acres rented; 5 acres deeded.

## HOG CHOLERA.

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BY GEO. A. WATERMAN, CONSULTING VETERINARIAN.

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Inasmuch as a large number of letters have been received asking for information concerning hog cholera, and also by reason of the fact that the disease is becoming quite prevalent throughout the State, it has been thought best that a bulletin be published upon the subject. The bulletin is a compilation of material from various sources and not from original work done by the writer. The reports from the Department of Agriculture at Washington, D. C., also bulletins from the Experiment Stations of Indiana, Iowa, Arkansas, Nebraska and other states, have been consulted.

Hog cholera, a disease peculiar to swine, has existed in this country to a greater or less extent for the past fifty years. It may appear at any time of year, although perhaps it is most often met with in autumn. There is another disease called swine plague which very closely resembles hog cholera in its effects and without doubt is often mistaken for it. At other times it is found associated with hog cholera, both diseases existing in the same herd, or even in the same animal. Inasmuch, however, as the results of the two diseases are about the same it is of little practical importance, whether we differentiate between them or not. Hog cholera attacks animals of all ages, but at times older hogs seem to be able to withstand the disease better than pigs.

### CAUSE.

The cause of hog cholera is the introduction into the body, through some avenue, of the specific germ of the disease, which is known as the hog cholera bacillus. For a short description of germs in general, what they are, and what they do, I would refer the reader to Bulletin No. 139. The virus in this disease gains entrance into the body through the digestive tract with the food or water, or it may enter through the lungs with the air. Fresh wounds may also at times furnish an opportunity for its entrance. Inasmuch as the theory of spontaneous generation of bacteria, as well as of other forms of life, has been exploded

in its application and interpretation. To the last theme, we shall give the weight of our attention.

Inasmuch as we are intending to place the complete records of the work with tuberculosis before our readers, it is expedient that we publish the complete records of the tuberculin test of the college herd. In so doing the test history of every animal will be constantly at hand for consultation, if we should have occasion hereafter to refer to it, and should, as we may expect, any of the animals not condemned at the present time react in the future. These records will be complete to the present time; and if anything of interest occurs in connection with the tests later, we shall publish it in due season.

We therefore have a two-fold object in view: First, to discuss the application and interpretation of the test; second, to place on record the tests as applied to the college herd.

It is pertinent at the start that no one sufficiently interested in the tuberculin test to study it for practical application should be satisfied with the perusal of a single experience. A comparative and close study is essential even after abundant personal experience may be brought to his aid.

#### WHAT IS TUBERCOLIN ?

Tuberculin was discovered by Koch in 1890 and considered by him as a specific cure for tuberculosis. [Its value as a cure may be discussed in a later bulletin.—Author.]

Several months passed before he made known to the scientific world its preparation. This was done through the *Deutsche Medicinische Wochenschrift* in October of 1891. A meat infusion to which was added four to six per cent. of glycerine and one per cent. of dry pepton was placed in wide bottom flasks. These had been previously plugged with cotton wool and sterilized. The flasks with their contents were then sterilized in steam. They were now ready for inoculation with tubercle bacilli taken from a pure culture. Some of the germs were floated on the surface of this food material; if the germs dropped to the bottom of the flask there would be little growth. After an interval of about six weeks there had formed a decided yellowish white scum over the surface of the infusion which began to break up into small patches and fall to the bottom. At this time it was concentrated to one-tenth its bulk and passed through an unglazed porcelain filter to remove the germ sediment. This gave a clear solution of tuberculin containing forty to sixty per cent. of glycerine. The tuberculin is in solution and in this form is used. It can be precipitated with alcohol; that is, upon the addition of alcohol a white precipitate is thrown down which contains within it the active property of tuberculin, but it cannot be regarded as pure tuberculin because of the associated material which may also be precipitated with alcohol.

The action of tuberculin is very peculiar: it is not strange that Koch and his followers were led astray in regard to its curative properties. They noticed in their first use of it that when a very small amount even less than one milligram was hypodermically injected a marked rise of temperature would follow in tuberculous subjects, while sound subjects would show no febrile reaction at all. Also, immediately about the tuberculous lesion, if it were on the surface of the body and could be watched, there would be a marked inflammation and many times slough-

ing away of part or all of the diseased tissue. The tubercle bacilli were not in the least injured by this change, and it was thought that in many cases this broken down tuberculous tissue would be disseminated throughout the body producing a generalized tuberculosis, in this way aggravating the condition very much.

De Schweinitz and Dorset, from cultures of tubercle bacilli grown upon a special cultural medium, have isolated a temperature reducing and a temperature producing substance, the latter of which is much the same, if not identical with tuberculin in raising the temperature, but much more intense and effective. It is hoped that our crude tuberculin will some day be simplified and made more reliable and constant. For if we are to judge from the sentiments expressed by Babes and Proco of the intimate relation of the germ-body to tuberculin, and of Koch in the preparation of his new tuberculin, we should be led to believe that this agent has a future which has not yet been conceived and that the percentage of error will still be lowered. The present indefiniteness of its component action can only result in the determination of its perhaps several constituents, one of which shall only be necessary for increased temperature production in tuberculous subjects.

#### HOW IS TUBERCULIN APPLIED?

In the treatment of this subject, we shall confine ourselves to its use in the diagnosis of tuberculosis in cattle.

The general principles underlying nearly all methods are: The ascertaining of the normal temperature; the injection of tuberculin; and, after an interval of a few hours, the taking of temperatures during a period of several hours. We can best gain a practical understanding by reviewing the recommendations and work of others.

The Bureau of Animal Industry at Washington, D. C., recommends the following course in using their tuberculin:

"1. Begin to take the rectal temperature at 6 a. m. and take every hour thereafter until midnight.

"2. Make the injection at midnight.

"3. Begin to take the temperature next morning at 6 a. m. and continue as on preceding day."

To those who have large herds to examine, or who are unable to give the time required by the above directions, the following shortened course is recommended:

"1. Begin to take the temperature at 8 a. m. and continue every two hours until 10 p. m. (omitting at 8 p. m., if more convenient).

"2. Make the injection at 10 p. m.

"3. Take the temperature next morning at 6 or 8 a. m., and every two hours thereafter until 6 or 8 p. m."

The Pasteur Vaccine Co. of Chicago gives these directions in the use of its tuberculin: "Before giving the injection, obtain the normal temperature. From the tenth to the twentieth hour after injection take the temperature every two hours. [Strictly speaking, it is sufficient to take the temperature only three times after injection, at the twelfth, fifteenth, and eighteenth hours; but it is preferable to take the temperature every two hours].

"It is well to take the temperature morning and evening for several days prior to injection. It happens sometimes that healthy animals show considerable variations in temperature; this is only temporary, and appears to be due to a slight momentary disarrangement of the digestive organs. It must also be remembered that when a cow is ready to 'bull' her temperature rises nearly two degrees. It is better to postpone the test with animals whose temperature is thus affected."

The directions issued must necessarily differ widely from the very nature of the case; each man giving his own version of the number of temperatures required before and after injection. This variation of application extends even to competent workers who do not deem it obligatory to adhere to any fixed rule of application. Russell (Wis.) in his report on the tuberculin test varied his methods considerably.

In his first test he took the temperatures before injection as follows: 4 p. m., 6 a. m., 8 a. m., 12 m., 4 p. m., 8 p. m., and after injection 6 hours, 8 hours, 9 hours, 10 hours, 11 hours, 12 hours, 14 hours, 16 hours, 18 hours, 20 hours, 24 hours, 28 hours, 40 hours. In the second test the temperatures before injection are represented by 4 p. m., 6 a. m., 12 m., 3 p. m., and after injection 5 hours, 8 hours, 10 hours, 13 hours, 16 hours, 18 hours, 20 hours, 24 hours.

Paige records a single normal temperature before injection, in one case at 4 p. m., in another at 4:30 p. m., and still another at 7 p. m. After injection the temperatures were taken at 6½ hours, 11½ hours, 15½ hours, 19 hours, 23 hours, 26 hours, or in some instances covering about the same duration and intervals of time. We note a similar method employed by Armsby, the normal temperature recorded only at the time of injection. Niles also makes use of this method. From what I have been able to learn, I would conclude that a single normal temperature before injection is a common method of veterinarians over the country. Curtice thinks two normal temperatures sufficient. We shall have occasion to say something about this before completing this bulletin. Uniformity may not be essential, yet a single temperature may represent too brief a process.

#### WHERE INJECT THE TUBERCULIN ?

It matters little where the tuberculin is injected. The neck or shoulder is usually selected. From my own standpoint the shoulder offers greater advantages as recommended by Curtice: there is little subcutaneous tissue if infection from foreign bacteria should occur while injecting, the skin is tense, and the shoulder is generally quiet while the neck may be in constant motion. The febrile constituent of the tuberculin is comparatively quickly diffused throughout the body no matter where injected.

#### THE AMOUNT OF TUBERCULIN INJECTED.

The amount of tuberculin (crude) necessary to produce a febrile condition in a tuberculous animal is quite variable, depending somewhat upon the size of the animal, small animals requiring less than large ones. There also appear, so far as we are able to conjecture, although it is not satisfactorily established, stages of the disease which require more

or less. In very advanced cases a large amount is indicated in the judgment of experienced operators. Koch ascertained that one milligram or less of tuberculin was sufficient to produce a rise of temperature in a man suffering from tuberculosis while it produced no effect in a sound man. The Bureau tuberculin is given in doses of 2 c. c. to full grown cattle. This tuberculin, however, is sent out by the Bureau in a diluted form. One-tenth, two-tenths, or three-tenths cubic centimeters of the concentrated tuberculin is considered sufficient for a single animal. This concentrated form may be procured from commercial houses, but it is always better to dilute it with an one-half per cent. solution of carbolic acid to make a wholesome dose and one which may readily be handled with a certain degree of security.

#### DISINFECTION OF THE PART INJECTED.

The place selected on the animal for injection should be properly disinfected with a five per cent. solution of carbolic acid or a solution of corrosive sublimate (one part of corrosive sublimate to one thousand parts of water). The spot should be thoroughly washed with either of these solutions. This is to prevent infection while injecting. The syringes and needles should be kept sterile and free from contamination.

#### THE DIAGNOSTIC VALUE OF TUBERCOLIN.

What value tuberculin possesses as a diagnostic agent could be readily stated, if we should confine our thoughts to our own experience. Ours is, however, the experience of only one and there are many others who do not think exactly as we do. For a man to satisfy himself with his own cooped up experience and then scatter it broadcast as the only correct experience is belittling and obnoxiously unfair. Experimental work without a large amount of comparative study means little and does much harm. While I shall give what evidence I possess before completing this bulletin, I should feel that a larger part had been omitted did I not present some experiments and opinions of a few other workers based upon their own experience.

Soon after Koch announced the discovery of his tuberculin and when scores of investigators were endeavoring to ascertain its physiologic action, Gutman of Dorfat made use of it December 25, 1890, upon some cattle. The rectal temperatures were taken at noon of the day of the injection and found to be 38.1° C, 38.5° C and 39° C. After the injection the maximum temperature reached 40° C, 40.8° C and 41.3° C respectively. The fever lasted four, nine and twelve hours. Sticker at about the same period reached almost identical conclusions as Gutman. The former did his work in Russia and the latter at Cologne, Prussia. Simultaneously with these two workers, at a French veterinary school, experiments of the same nature were in progress. The conclusions were practically the same, that is, tuberculin produced a rise of temperature in tuberculous animals.

In 1891 Eber summed up results with tuberculin. He showed that of one hundred thirty-four cattle which reacted to tuberculin and autopsied, eighty-five and eighty-three one-hundredths per cent. were tuberculous.

Of one hundred thirteen which showed no reaction after the injection of tuberculin and were killed, eighty-nine and thirty-eight one-hundredths per cent. were free from tuberculosis. This demonstrates, throwing aside all possibility of error in determining the disease as must be done in every case, that there were fourteen and eighteen one-hundredths per cent. of failures in the cases condemned by the reaction and ten and sixty-two one-hundredths per cent. of failures where there was no reaction. The importance of this summary cannot be overestimated.

In reviewing the reports and opinions of tuberculin as a diagnostic agent the *Lancet* of March 21, 1891, has the following to say: "The importance of a new aid to the diagnosis of tubercular disease within the body is obvious, not only as enabling one to differentiate it from allied conditions, but as a guide to the early adoption of therapeutical measures. In Koch's tuberculin it was hoped that we should possess a divining-rod which would reveal the hidden foci of an insidious malady, and there were many who declared that therein would lie its chief value. Experience, however, as embodied in these reports, compels but a guarded acceptance of this opinion. A few observers such as Professors Lichtheim and Schreiber of Königsberg, and Dr. P. Guttman of Berlin regard it as an efficient test, but Prof. Leyden (Berlin) thinks it cannot be solely relied upon, and Prof. Gerhardt says that no reaction was observed in some cases when bacilli were present. Prof. Ebstein (Göttingen), who appears to have been the least impressed of all with the value of the remedy, does not think there is any absolute certainty in its use for diagnostic purposes. Prof. Biermer (Breslau) is also very cautious; he had two cases of undoubted tuberculosis with bacillary expectoration, which gave no reaction, either local or general; while in another case, of alcohol tabes, with no suspicion of tubercle, there was a marked general reaction. Prof. Quincke (Kiel) thought it gave more certain indications in cases of slight lung disease, but could not admit there was latent tubercle in every case in which a general reaction followed the injection. The Greifswald professors—Mosler, Strubing, and Peiper,—speak with somewhat more confidence, whilst Professor Schultz of Bonn thinks it a test within limits and Professor Weber of Halle that it is far less certain diagnostically in internal than in external tubercle. Professor Finkler of Bonn met with but few exceptions to the rule of reaction among cases of commencing phthisis, and did not regard the absence of reaction in chronic phthisis as diminishing its value in diagnosis. Lastly, Professor Rumff (Marburg) believed it was a test which should always lead to greater care in physical exploration of the chest and in search for bacilli."

In July, 1892, Bang reviewed the work of some experimenters. Schutz and Rosval tested sixty-six animals, forty-four of which responded to the tuberculin. In ten of these which showed a reaction, traces of tuberculosis could not be found upon autopsy. In Nocard's cases, twenty cows reacted and eighteen were found to be tuberculous. The other two had liver disease and enlarged lymphatic glands. Thirty-seven cases did not react. Of these thirty-five were healthy and two affected with a mild form of tubercle.

Clement reports that out of 500 animals tested he had only a single error, 100 of these 500 reacted and were slaughtered. The error was in a case of advanced tuberculosis which failed to respond to a small dose of tuberculin.

The United States Veterinary Medical Association at their meeting in Buffalo, September, 1896, published the following:

"Whereas, Tuberculosis of some of our domestic animals, and especially of cattle, is a wide-spread and destructive disease; and

"Whereas, The statistics accumulated during the year past show that the disease is very prevalent throughout this country, especially in dairy herds, indicating that it is steadily increasing, except in states where active measures for its suppression have been enforced; and

"Whereas, There exists in some quarters a difference of opinion as to the relation of tuberculosis among cattle to the public health, notwithstanding the fact that this matter has been the object of careful scientific inquiry by a great number of eminent scientists in all parts of the world, and that reliable and uniform observations are recorded in great numbers in the veterinary and medical literature, by it;

"Resolved, That it is the opinion of the United States Veterinary Medical Association that the following points have been demonstrated beyond dispute and may be accepted as fully established: First, that tuberculosis of man and cattle is identical; second, that the milk from cows with tuberculous udders may cause tuberculosis in animals fed upon it; third, that the milk from cows with extensive tuberculosis, but apparently healthy udders, may, in some cases, contain the germ of tuberculosis, and cause the disease in animals fed upon it; fourth, that in some cases the germs of tuberculosis appear in the milk of tuberculous cows that are not far advanced in the disease, and of others that are healthy, so far as can be determined by an examination made during the life of the animal; fifth, slightly tuberculous cows sometimes succumb to the sudden exacerbation of tuberculosis and furnish virulent milk for a period before it is possible to discover their conditions by means of physical examination; sixth, tuberculin furnishes incomparably the best means of recognizing tuberculosis in the living animal; seventh, tuberculin, properly used for diagnostic purposes, is entirely harmless to healthy cattle and is so exceedingly accurate in its effects that the few errors resulting in its use cannot affect the general results, and are of less frequent occurrence than following the use of any other method of diagnosing internal diseases; eighth, that the carcasses of tuberculous animals may be and sometimes are dangerous to the consumer, and all carcasses should be subject to a rigid inspection by a competent veterinarian, and those that are condemned should be disposed of in such a manner that it will be impossible to put them on the market for consumption as human food; ninth, that the importance of dairy inspection cannot be overestimated, and municipal and health authorities should at once perfect a system commensurate with the vast importance of the subject.

"Resolved, That the live stock, and especially the breeding interests of this country can never regain their former prosperity until such measures have been carried out by the National and State governments as will afford some reasonable guaranty against the continued ravages of this disease. And, in view of the prevalence of bovine tuberculosis in foreign countries and the measures taken by some of them to protect their cattle from infection, the United States should prohibit the importation of breeding animals until they have been proven by the tuberculin test to be free from the disease."



Nocard, an ardent admirer of tuberculin, says: "Every one admits to-day the exactitude and marvellous precision of the diagnostic indications furnished by tuberculin."

Grange says: "Tuberculin is now recognized the world over as the most reliable, safe and practical method of diagnosing tuberculosis." Out of 849 tested animals he found 107 which reacted. These cattle were cattle generally suspected before the application of the test. Grange says further: "I have used tuberculin in upwards of a thousand instances in this State (Michigan) during the past two years and have not discovered a case in all these which would impeach the test."

In the earlier days of testing tuberculin, the per cent. of error due to tuberculin appears greater than in more recent time. The investigators who usually carried out these experiments were trained scientific men. After the test had been applied a careful examination was made of every animal tested and it was usually found that the per cent. of error was not unnoticeably small either where the tuberculin failed to detect tuberculosis or where a rise of temperature occurred, sufficient to condemn the animal, probably from some other source than tuberculin. Still tuberculin must be regarded as an excellent diagnostic inasmuch as it is far superior to any clinical methods now known.

While the statistics offered by practitioners are interesting and exceedingly valuable, they cannot be regarded as accurate or unquestionable, for the practitioners were concerned only in establishing tuberculosis in the cattle they had condemned by the use of tuberculin. It is the best that can be done under the circumstances and I do not impeach their work. The objections I would offer to such statistics as truly accurate are:

1. Tuberculin tests are applied under the assumption that they are infallible.
2. Such an assumption necessarily leads to inaccuracy.
3. The condemned animals only are slaughtered for the purpose of examination.
4. Exact examinations are not always made of the supposed tuberculous lesions, if any are found.
5. The number of tuberculous animals remaining behind because of a failure to react cannot be estimated.

For these reasons the ordinary reports of tests which involve thousands of animals cannot be regarded as an exact test of tuberculin, and can only be looked upon as a proof of the value of tuberculin. Clinicians' reports are never used as a basis to compute the exactness of knowledge; if this were not so, tuberculosis would have long ago been eradicated by reports of cures, testimonials and various remedies.

In the spring of 1896 Prof. Grange began the work of eradicating tuberculosis from the college herd and he conscientiously followed up the work till the summer of 1897 when he became dean of the veterinary department of the Detroit Medical College. This work was done by the use of tuberculin, and, inasmuch as his report will follow in this bulletin, I am glad to give the methods he employed as stated by him in his report to the Live Stock Sanitary Commission when he was State Veterinarian: "The plan which I have adopted for applying the test is, substantially that which has been recommended by the Bureau of Animal Industry of the Department of Agriculture at Washington, D. C., which suggests that the temperature

of the animal to which the test is to be applied shall be taken every two hours during the day previous to the injection of the fluid. About ten o'clock at night the fluid is introduced beneath the skin of the animal—about a half teaspoonful of the fluid which has previously been diluted for convenience in handling. It is customary to administer about half the dose to yearlings and two-year-olds, while very large cows and male animals received about a teaspoonful. It has been my custom to leave the animals to themselves after injecting for about eight hours, when the temperature is again taken, and observations of the heat of the animal's body should be made every hour during the day after the tuberculin has been administered. My observation has been that those animals which are affected with the disease begin to react about nine or ten hours after the medicine has been given and continue to do so for about four or five hours when the temperature will begin to fall and soon reach the normal. There is, however, considerable variation in individuals in their behavior as to the time and degree of reaction towards the medicine. It is customary to regard an animal as affected with the disease when it shows a temperature two degrees above the highest point of the day previous to the administration of the medicine. In cases where the reaction is less than two degrees it has been my practice, where I have had full control of the herd, to place such animal in the doubtful list to be retested at a future time."

Since Professor Grange has been connected with this work of the station, I wish to quote him further in regard to his idea of the interpretation of the tuberculin test. There is ample room for different interpretations and I desire that his reports shall fairly represent his views. His interest in this work has remained unabated.

"A brief account of some animals which were placed in the doubtful list, will, no doubt, impress the reader with the very great importance of careful manipulation of the thermometer in reading it, and also impress upon him the advisability of retesting animals which have shown the slightest indication towards a rise in temperature the day after the fluid has been given.

"On the 31st of March, 1896, I tested a herd of 67 cattle. Among them nine animals reacted in a manner indicating tuberculosis, while 18 of them dropped into the doubtful list, one of which only reacted one-tenth of one degree, another three-tenths of a degree, another six-tenths of a degree, and still another one degree and eight-tenths. On the 11th of May these animals were retested. The first one reacted two degrees and six-tenths, the second one, six-tenths of a degree, the third one, one degree and five-tenths, the fourth, two degrees. The first and fourth were condemned according to the requirements of the test. The fourth animal was badly affected with the disease which was very apparent upon the most casual observation. The first one, or No. 1, although reacting two-degrees and six-tenths did not show any external manifestations of the disease but was killed and after a diligent search some of the cheesy tubercle was discovered. Not being satisfied with the ocular examination, the microscope was used when the bacillus was discovered. Besides this, some of the material was inserted beneath the skin of a Guinea pig which eventually died of tuberculosis and in this animal the germs could readily be seen when stained according to Ziehl's method. No. 4 was also killed and showed such exaggerated lesions of tuberculosis that nothing

more was done so far as studying the disease in her was concerned. Nos. 2 and 3 were again retested in August, No. 2 reacting two degrees and eight-tenths, No. 3 reacting one degree and eight-tenths. The latter two are at the present time being held for experimental purposes. It is worthy of note that three of the four animals would not have been considered as being affected with the disease according to the methods adopted in transatlantic countries where it is stated, according to a description of the application of the test in a volume written by Nocard: 'Elevations of temperature of less than eight-tenths of a degree have no meaning. Every animal whose temperature indicates an elevation between eight-tenths of a degree and one degree and four-tenths must be considered under suspicion and will have to undergo, after an interval of a month or so, a new injection of a larger dose of tuberculin. [These temperatures are stated by Nocard according to the centigrade system  $.8^{\circ}\text{C.}=1.44^{\circ}\text{F.}$ ,  $1.4^{\circ}\text{C.}=2.52^{\circ}\text{F.}$  This may be a little misleading as it stands without designating what system is meant. Prof. Grange used the Fahrenheit system.—Author.] It is probably owing to the fact that sufficient importance has not been attached to the minutest elevation in temperature that tuberculin has been wrongfully blamed for missing cases that were afterwards shown to be affected with the disease. Setting the condemning figure at one and four-tenths (this should be translated as centigrade.—Author) or two degrees is only arbitrary as far as I am aware. Experience with tuberculin has caused me to believe that if this agent causes the elevation of temperature, even to a slight extent, it is an indication of tuberculosis. Unfortunately we are not able to tell whether it is the tuberculin or something else which causes this elevation, so a wide margin is taken and set at two degrees and mistakes are reduced to the minimum in careful hands."

Since the testing of the college herd has fallen to my lot, I have attempted to establish the value of the tuberculin in an indirect manner, and have endeavored to find what significance an arbitrary point of condemnation has, besides the primary effort to eradicate tuberculosis from the herd.

By saying I have tried to ascertain the value of tuberculin in an indirect manner, I mean especially the errors which are possible during the tuberculin test, which, in all probability, do not result from tuberculin itself but rather from our inability to understand the cases which arise. They are perplexing and confuse our clear conceptions of the tuberculin test. Neither the eye of a skilled veterinarian nor the hand of a careful manipulator is capable of revealing the cause of these functional disturbances which produce a wide range of variability in an apparently normal condition. Speculation in a learned professional way only makes our ignorance more intense and until science can give us the truth we might as well state flat-footed that it is beyond us. Indigestion, the common answer, may be correct, nervous excitability may be correct, cold may be correct and a dozen other answers may be correct, but we are usually unable to detect which one of a dozen possible disorders is the momentary or prolonged cause, and if this disarrangement should occur while taking the temperatures after the injection, who is going to tell whether it is the action of the tuberculin or some other agent? Fortunately, however, the chances stand about 9 to 1 in favor of the tuberculin. For this reason we are safe in recommending tuberculin with the possibility of this error. To eliminate all error so far as possible in making the test, we have not

allowed anything to stand in the way. A detailed description of how we proceeded may be in order to justify us in saying that so far as practicable we tried to obtain the truth.

**Thermometers.**—Much is said about the use of thermometers. It is true that thermometers may lead astray; not only the thermometer itself but the reader also. For our use we obtained the English Hick's clinical thermometers with patent lens front to facilitate reading. The thermometers are self-registering and have an indestructible index which will not become obliterated by frequent use. The certificate of examination and correction accompanies each thermometer. These thermometers are very expensive, costing in the neighborhood of \$2.50 each at retail prices, consequently cannot be recommended for ordinary testing. I believe these thermometers are correct, for in the various tests I have made of them I have not found them otherwise than represented. If error has occurred in my work, I cannot attribute it in any large part to the thermometer.

In using the thermometers I bound them at the lower and upper ends to a strong glass rod about one quarter inch in diameter. This was done for the purpose of protecting the fragile thermometers and of keeping them clean with a disinfecting solution. The metallic cases commonly used for protection cannot be kept clean, and they do not give as free exposure to the bulb of the thermometer as when attached to a glass rod. For ordinary work, however, I do not think that I would substitute the glass rod for the metallic case, for the metallic case gives greater protection to the thermometer and there is less likelihood of breaking. To the upper end of the glass rod and thermometer a string is tied which has a hook on the end. This enables the operator to hook the thermometer, when inserted, to a string which is stretched around the cow in front of her hips.

In managing the thermometer, the operator first shakes it down below the 97° mark; this is checked by the recorder of temperatures who accompanies him. The thermometer is then inserted into the rectum to its very top end and the hook attached to the string around the body to prevent falling to the floor should the animal defecate suddenly. Three minutes are allowed for the necessary time to obtain the correct temperature of the animal. The time is put down on paper by the recorder when the operator calls out its insertion; and the thermometer is taken out only when the three minutes are up by the watch. The operator withdraws it when so ordered by the recorder, carefully wipes it off so that the index may be easily seen by the reader, hands it first to the recorder who reads it in silence. The recorder hands it then to the operator who reads it aloud. If the readings check each other, it is then recorded; if not they study it carefully till they can agree. If there is any plausible question about the temperature, they take the temperature again. After the reading, the mercury is shaken down by the operator below 97° and checked by the recorder. The thermometer is carefully wiped off and dipped into a disinfecting solution. From this the end is dipped into carbol-vaseline and inserted into the next cow.

The checking system I deem very essential for accurate results, for even old readers are likely to make serious errors after the monotony is on, and new readers make many and very grave blunders, but by constant correction they soon become able readers. After three hours of steady employment, they make no more failures than do old readers. They become very proficient.

**Hours of Temperatures.**—From the first I have given much attention to the study of normal temperatures. In my first test last summer, two days were given to the study of normal temperatures just as if I were applying a regular test with this exception, we did not take the two and three hours in the early morning. Temperatures were taken every hour beginning at 7 o'clock in the morning and closing at 6 o'clock in the afternoon with one hour out for dinner. One day was allowed to elapse for the cows to rest and return to normal conditions and circumstances. The normal temperatures were again taken for another day, the tuberculin injected that night and temperatures resumed eight hours after injection and carried on till six o'clock at night with hours for breakfast and dinner out. To do good work the operators and recorders should not be allowed to grow tired. During the test in the fall, we took three days continuous temperatures, two normal and one after injection. This method was found to be unsatisfactory because the cattle became restless the third day. In the test this spring we went back to our first plan.

**Injection.**—We use the tuberculin prepared by the Bureau of Animal Industry, Washington, D. C. One c.c. is injected into calves, 2 c.c., into ordinary size cattle and 3 c.c. into large animals. For the purpose of injection, a syringe with two holes for the fingers to hold it and one for the thumb to work the piston is made of a glass barrel with a metallic case. The nozzle for the needle is smooth instead of the screw, thus allowing the removal and placing of the needle with ease. The needles are about two inches long and made of steel. There should be several of them. While injecting, the extra needles are kept in a disinfecting solution and should be changed with each cow.

The place of injection on the cow must be thoroughly disinfected. I do not deem the clipping of the hair necessary, although it may be a wise precaution. The syringe ready and the shoulder disinfected, the injection may be easily made with sharp needles. The operator should see that his hands and syringe are constantly disinfected. With sufficient help the injection may be done quickly. Great care, I repeat, should be exercised in obtaining the right kind of needles. My experience with poor needles forces me to make this emphatic. By injecting on the opposite side of the cow from that where you take your position will be found upon trial a very desirable method in avoiding the spontaneous actions of the animal while the needle penetrates the skin.

The study of temperatures when the test is at an end is one that requires perhaps the most deliberate thought. Since there will be all degrees of variation; and when it comes to a matter of deciding whether an animal will be condemned or not, perplexities will flood the mind. There will always be suspicious animals; there will be some which react, we will say, two degrees but the reaction is confined to a single hour. Cases of various kinds will present themselves. That this phase of the subject may be thoroughly understood and appreciated, the tables as representing the work here since the spring of 1896 will be of great use.

Key to the animals of the tables.

No. of animal	Breed.	Birth.	Sex.	Name.	Breeding.
1	Jersey	April 20, 1892	Male	Bettas Averroes, 35119	{ Sire—Averroes, 2500. Dam—Retta of Bloomfield, 26520.
2	Short Horn	Feb. 12, 1891	Female	College Mysie 3d, Vol. 37, p. 716	{ Sire—Volunteer, 101205. Dam—Mysie 44, Vol. 25, p. 845.
3	"	Mar. 10, 1896	Male		{ Sire—Royal Mysie, 120659. Dam—Mysie, Vol. 37, p. 716.
4	Holstein	Jan. 12, 1890	Female	Belle Sarcastic, 22039	{ Sire—Sarcastic, 4729. Dam—Belvisia, 4553.
5	Red Polled	July 27, 1893	"	Cara (No. 9), 8993	{ Sire—Bower Baron, 1468. Dam—Bower Belle, 6208.
6	Holstein	April 13, 1894	"	College Belle Sarcastic, 37016	{ Sire—Maurice Clothilde, 17638. Dam—Belle Sarcastic, 22039.
7	"	Feb. 6, 1894	"	College Rosa Bonheur, 37013	{ Sire—Maurice Clothilde, 17638. Dam—Rosa Bonheur 5th, 11227.
8	Jersey		"	Hallo.	
9	Holstein	Mar. 12, 1888	"	Houwte D., 12005	{ Sire—Jumbo Boy, 1983 H. H. B. Dam—Houwte, 2941.
10	"	Mar. 20, 1888	"	Rosa Bonheur 5th, 11227	{ Sire—Meadow Brook Chief, 1989. Dam—Rosa Bonheur, 890, H. H. B.
11	"	April 18, 1891	"	College Houwte, 28282	{ Sire—Kaastra's Prince, 14770. Dam—Houwte D., 12005.
12	"	Oct. 31, 1892	"	College Pauline America, 32337	{ Sire—Paul DeKol, 14634. Dam—Aaggie Wayne 3d's America, 27762.
13	"	Jan. 28, 1892	"	College Pauline Wayne, 30900	{ Sire—Oakta 3d's Wayne, 23427. Dam—Oakta 3d's Wayne, 5166.
14	"	Mar. 26, 1890	"	Oakta 3d's Wayne, 23427	{ Sire—Neptune Prince of Wayne, 5166. Dam—Oakta 3d, 3547.
15	Swiss	Mar. 3, 1892	"	Becky, 834	{ Sire—Werner Stauffacher, 436. Dam—Bettichard's Lanbi, 717.
16	Short Horn	Mar. 23, 1893	"	College Mysie 5th, Vol. 40, p. 753	{ Sire—Volunteer, 101205. Dam—Mysie 44, Vol. 25, p. 845.
17	"	June 29, 1892	"	College Mysie 4th, Vol. 39, p. 602	{ Sire—Volunteer, 101205. Dam—Mysie 44, Vol. 25, p. 845.
18	Grade		"	Milla.	
19	Hersford	Oct., 1891	"	Caprice, 51127	{ Sire—Star Grove 19th, 28594. Dam—Emmeline, 4501.
20	Short Horn	Mar. 29, 1894	"	College Mysie 6th, Vol. 40, p. 753	{ Sire—Volunteer, 101205. Dam—Mysie 44, Vol. 25, p. 845.
21	"	Jan. 3, 1892	"	College Victoria C, Vol. 39, p. 602	{ Sire—Volunteer, 101205. Dam—College Victoria, Vol. 31, p. 793.
22	"	Feb. 16, 1891	"	College Victoria B, Vol. 37, p. 716	{ Sire—Volunteer, 101205. Dam—College Victoria, Vol. 31, p. 793.
23	"	Mar. 21, 1883	"	College Duchess A, Vol. 40, p. 753	{ Sire—Volunteer, 101205. Dam—College Duchess 4th, Vol. 35, p. 772.

Key to the animals of the tables.—Continued.

No. of animal.	Breed.	Birth.	Sex.	Name.	Breeding.
24	Aberdeen-Angus	Dec. 30, 1890....	Female....	Baroness of Terlington, 14483	Sire—Day Star, A. M. 5307. Dam—Nellie of Hillhurst, 4918.
25	Short Horn	Jan. 29, 1886....	"	College Victoria, Vol. 31, p. 783	Sire—Col. Acornb 2d, 37984. Dam—College Victoria Duchess 2d, Vol. 23, p. 17798.
26	Jersey	May 11, 1890....	"	College Pogis, 75078	Sire—Lily's Nero, 19041 Dam—Pogis Baronne, 52272
27	"	Jan. 3, 1888....	"	Pogis Baronne, 52272	Sire—Pogis Baronne, 52272 Dam—Barronne, 7101
28	"	Feb. 29, 1892....	"	College Dame LeBrocq, 7949	Sire—Lily's Nero, 19041 Dam—Dame LeBrocq, 54075.
29	"	Nov. 13, 1892....	"	College Pogis 2d, 101777	Sire—College Nero, 29138. Dam—College Pogis, 75078.
30	"	Mar. 27, 1894....	"	Dame LeBrocq 2d, 100322	Sire—Lily's Nero, 19041 Dam—Dame LeBrocq, 54075.
31	Guernsey	Aug. 21, 1892....	"	Poly's Blossom, 6376	Sire—Orient, 2567 Dam—Polyander, 2928.
32	"	Jan. 12, 1892....	"	Aida 2d, 6112	Sire—Orient, 2567 Dam—Aida, 3518.
33	"	Jan. 20, 1893....	"	College Chameau	Sire—Orient, 2567 Dam—Chameau, 2136.
34	Holstein	Nov. 11, 1894....	"	College Pauline Clothilde, 39198	Sire—Maurice Clothilde, 17638. Dam—College Pauline Wayne, 30900.
35	Red Polled	July 16, 1895....	"	Bower Belle (25), 6208	Sire—Bland, 1340. Dam—Lettion Spotless, 4622.
36	Grade	"	"	Hebe.	
37	Short Horn	July 29, 1895....	"	College Mysie 7th, Vol. 40, p. 753	Sire—Volunteer, 101205. Dam—College Mysie 3d, Vol. 37, p. 718.
38	"	Mar. 29, 1894....	Male	College White Boy	Sire—Volunteer, 101205. Dam—College Duchess 4th, Vol. 35, p. 772
39	Grade	"	Female....	Materna.	
40	"	"	"	"	Sire—Materna. Dam—Materna.
41	Short Horn	May 12, 1892....	"	Mysie 44, Vol. 25, p. 845	Sire—5th Duke of Ackland, 41734. Dam—Mysie 43, Vol. 25, p. 675.
42	"	Mar., 1896....	"	"	Sire—Volunteer, 101205. Dam—Mysie 44, Vol. 25, p. 845.
43	"	Sept. 22, 1893....	Male	Royal Mysie, 120859	Sire—Double Victor, 111558. Dam—Mysie of Pleasant 2d, Vol. 39, p. 757.
44	Swiss	May 24, 1893....	"	Colonel Barton, 644	Sire—Francis B., 396 Dam—Ginderella, 625
45	Holstein	May 22, 1895....	"	Maurice Bonheur, 22,394	Sire—Maurice Clothilde, 17638. Dam—Rosa Bonheur 5th, 11227.
46	Jersey	April 23, 1895....	"	General Longstreet, 40948	Sire—Tormontor's Bully, 30273. Dam—Lizzie E., 63112.
47	Red Polled	July 7, 1895....	"	College Corbett 2d	Sire—Jim Corbett. Dam—Cara, 3393.

48	Short Horn	April 3, 1895	"	Mysie 4th's Volunteer	Sire—Volunteer, 10126. Dam—Mysie 4th, Vol. 39, p. 602.
49	Jersey	Sept. 11, 1895	Female		Sire—Rettas Averroes, 3519. Dam—College Dame LeBrocq, 7949.
50	Grade	May 6, 1895	Male	College Blue Boy	Sire—Volunteer, 10126. Dam—Baroness of Terlington, 14483.
51	Short Horn	June 18, 1895	"	College Volunteer	Sire—Volunteer, 10126. Dam—College Victoria C, Vol. 39, p. 602.
52	Holstein	Dec. 3, 1895	Female	College Houwje Maid, 41760	Sire—Maurice Clothilde, 17638. Dam—Houwje D, 12005.
53	"	Feb. 28, 1896	"	College Belle, 41761	Sire—Maurice Clothilde, 17638. Dam—Belle Sarcastic, 20038.
54	Short Horn	Nov. 19, 1895	Male		Sire—Volunteer, 10126. Dam—College Victoria B, Vol. 37, p. 716.
55	Holstein	Feb. 13, 1896	"	College Maurice Wayne, 23016	Sire—Maurice Clothilde, 17638. Dam—College Pauline Wayne, 30900.
56	Jersey	Oct. 20, 1895	Female	College Pegis 3d, 125892	Sire—Rettas Averroes, 35119. Dam—College Pegis, 75078.
57	"	Nov. 15, 1895	"	College Retta, 125893	Sire—Rettas Averroes, 35119. Dam—College Pegis 2d, 101777.
58	Holstein	April 2, 1896	Male		Sire—Maurice Clothilde, 17638. Dam—Oakta 3d's Wayne, 23127.
59	Swiss	April 2, 1896	Female	College Bravura	Sire—Col. Barton, 644. Dam—Bravura, 855.
60	Short Horn	May 2, 1896	Male	College Royal Mysie	Sire—Royal Mysie, 120659. Dam—College Mysie 5th, Vol. 40, p. 753.
61	Holstein	May 25, 1896	"		Sire—Maurice Clothilde, 17638. Dam—College Pauline America, 30900.
62	Short Horn	April 4, 1896	"		Sire—Royal Mysie, 120659. Dam—College Duchess A, Vol. 40, p. 753.
63	Jersey	May 6, 1896	Female	College Dora, 125894	Sire—Rettas Averroes, 35119. Dam—College Dame LeBrocq 2d, 100322.
64	Grade	"	"	Black Diamond	
65	"	"	"	White Star	
66	"	"	"	Blaze Group	
67	Cross	Sept. 23, 1896	Male	Baroness Boy	
68	Holstein	Sept. 4, 1896	"	Bonheur Boy	Sire—Royal Mysie, 120659. Dam—Baroness of Terlington, 14483.
69	Cross	Oct. 8, 1896	"	Caprice Boy	Sire—Houwje Clothilde A, 21482. Dam—College Rosa Bonheur, 37013.
70	Galloway	June, 1896	Female	Lillie of Bath, 11691	Sire—Royal Mysie, 120659. Dam—Caprice, 51127.
71	Red Polled	Sept. 19, 1896	Male	College Chandler	Sire—Col. Davis, 10534. Dam—Hazel of Bath, 10140.
72	Jersey	Apr. 13, 1897	Female	College Pegis 4th, 125896	Sire—Duke of Chandler. Dam—Bower Belle, 6208.
73	"	Mar. 21, 1897	Male	Baron Averroes	Sire—Rettas Averroes, 35119. Dam—College Pegis, 75078.
74	Holstein	Apr. 2, 1897	Female	College Polly, 42673	Sire—Rettas Averroes, 35119. Dam—Pegis Baronne, 52272.
75	Jersey	Oct. 30, 1896	"	College Retta 2d	Sire—Maurice Bonheur, 22394. Dam—College Pauline Clothilde, 38198. Sire—General Longstreet, 40848. Dam—College Pegis 2d, 101777.



# MICHIGAN EXPERIMENT STATION

No. of animal.	Breed.	Birth.	Sex.	Name.	Breeding.
76	Holstein	Dec. 19, 1896	Female	College Houwtje 3d	{Sire—Maurice Bonheur, 22394. Dam—Houwte D, 12005.
77	Short Horn	Dec. 21, 1896	"	College Queen	{Sire—Royal Myste, 120859. Dam—College Victoria B, Vol. 37, p. 716.
78	Red Polled	Dec. 30, 1896	"	College Cara	{Sire—Duke of Chandra. Dam—Cara (No. 9), 8393.
79	Holstein	Mar. 9, 1897	"	College Pauline Bonheur, 42672	{Sire—Maurice Bonheur, 22394. Dam—College Pauline W, 22394.
80	"	Feb. 27, 1897	"	College Rosa Bonheur Queen, 42674	{Sire—Maurice Bonheur, 22394. Dam—Rosa Bonheur, 541, 11227.
81	Short Horn	Oct. 23, 1896	Male	College Royal	{Sire—Royal Myste, 120859. Dam—College Victoria C, Vol. 38, p. 602.
82	"	Feb. 27, 1897	Female	College Myste Laasle	{Sire—Royal Myste, 120859. Dam—College Myste 6th, Vol. 40, p. 753.
83					
84	Cross	Nov. 2, 1896	Male	College Cross	{Dam—Poly's Blossom, 6378. Sire—General Longstreet, 40848.
85	"	May 12, 1897	Female	College Becky	{Dam—Aida 2d, 6112. Sire—College Barton, 644.
86	Grade		"		{Dam—Becky, 854.
87	"		"		
88	"		"		
89	"		"		
90	"		"		
91	"		"		
92	"		"		
93	"		"		
94	"		"		
95	"		"		
96	"		"		
97	"		"		
98	"		"		
99	"		"		
100	"		"		
101	"		"		
102	"		"		
103	"		"		
104	"		"		
105	"		"		
106	"		"		
107	"		"		
108	"		"		
109	"		"		
110	"		"		
111	"		"		

112	Holstein	Sept. 4, 1897	Male	Bonheur Boy 2d	Sire—Houwte Clothilde A, 21482. Dam—College Rosa Bonheur, 37013.
113	"	Aug. 13, 1897	"	College Belle Sarcatic's Boy	Sire—Maurice Bonheur, 22394. Dam—College Belle Sarcatic, 37016.
114	Jersey	Aug. 13, 1897	"	Gen. Longstreet's Pogs, 48933	Sire—General Longstreet, 40848. Dam—College Pogs 3d, 75078.
115	"	Aug. 27, 1897	Female	College Pandora, 126112	Sire—General Longstreet, 40848. Dam—College Retta, 125836.
116	Grade	"	"	"	"
117	Galloway	Oct. 18, 1897	"	College Lily	Sire—Lily of Bath, 11691. Dam—General Longstreet, 40848.
118	Jersey	Oct. 15, 1897	Male	College LeBrocq's Longstreet	Sire—College Dame LeBrocq, 79449. Dam—General Longstreet, 40848.
119	Cross	Oct. 22, 1897	"	College Cross	Sire—Aida 2d, 6112. Dam—Paul Mutual DeKol, 18726.
120	Holstein	"	"	Colantha Lad, 23883	Sire—Paul Mutual DeKol, 18726. Dam—Colantha 4th, 55028.
121	Short Horn	Oct. 22, 1897	Male	College Royal 2d	Sire—Royal Mysie, 126839. Dam—College Victoria C., Vol. 39, p. 602.
122	Jersey	Dec. 24, 1897	"	"	Sire—General Longstreet, 40848. Dam—College Dame LeBrocq 2d, 100522.
123	"	Nov. 13, 1897	Female	College Prudence, 125885	Sire—General Longstreet, 40848. Dam—College Pogs 2d, 101777.
124	Red Polled	Nov. 5, 1897	"	College Cara 2d	Sire—Duke of Chandler. Dam—Cara (No. 9), 8383.
125	Holstein	Oct. 26, 1897	"	College Oatka Bonheur	Sire—Maurice Bonheur, 22394. Dam—Oatka 3d's Wayne, 23427.
126	"	Oct. 16, 1897	Male	Houwte Maurice Bonheur	Sire—Maurice Bonheur, 22394. Dam—College Houwte, 25232.
127	"	Feb. 17, 1898	Female	"	Sire—Maurice Bonheur, 22394. Dam—College Belle, 41761.
128	"	Feb. 1, 1898	"	"	Sire—Maurice Bonheur, 22394. Dam—Houwte D, 12005.
129	Short Horn	Oct. 16, 1897	"	College Mysie 8th	Sire—Royal Mysie, 126839. Dam—College Mysie 3d, Vol. 37, p. 716.
130	"	Dec. 20, 1897	Male	Mysie 5th's Royal	Sire—Royal Mysie, 126839. Dam—College Mysie 5th, Vol. 40, p. 753.
131	"	Jan. 19, 1898	"	"	Sire—Royal Mysie, 126839. Dam—College Mysie 4th, Vol. 39, p. 602.
132	"	Mar. 2, 1899	"	"	Sire—Royal Mysie, 126839. Dam—College Mysie 6th, Vol. 40, p. 753.
133	Cross	Mar. 8, 1898	"	"	Sire—Colonel Barton. Dam—College Dora, 125894.
134	Grade	"	Male	"	"
135	Cross	Dec. 22, 1897	Female	"	Sire—Royal Mysie, 126839. Dam—Dorcas of Terington, 14483.
136	Holstein	Oct. 18, 1897	Male	Sarcatic's Lad, 23871	Sire—Maurice Bonheur, 22394. Dam—Belle Sarcatic, 23039.

## EXPLANATION OF TABLES WHICH FOLLOW.

Tables I. to VIII. inclusively represent the work of Prof. E. A. A. Grange while connected with the college.

Each day's maximal temperature is indicated by a dagger †.

Each day's minimal temperature is indicated by a double dagger ‡.

Reactions and reactionary animals are indicated at the left of the number by a +. By reactionary animals I mean those animals which have once reacted and which may or may not show a reaction thereafter. Animals which reacted in the first test are marked in each test thereafter whether there is any reaction or not.

The animals were watered between 10 a. m. and 12 n. in Tables IX. to XXI. inclusively.

The tables which follow will be used as a basis for further discussion.

TABLE I.\*

No. of animal.	Am't in- jected.	Time of in- jec- tion.	Temperatures before injection.				Temperatures after injection.									
			March 31, 1896.				April 1, 1896.									
			8 a. m.	10 a. m.	12 n.	2 p. m.	6 p. m.	6 a. m.	7:30 a. m.	9 a. m.	10:30 a. m.	12:30 p. m.	2 p. m.	3:30 p. m.	4:15 p. m.	6 p. m.
1.	2 c. c.	10 p. m.	101	99.5	99.3	98.5	100.7	98.6	98.3	97.0	101.2	98.6	100.0	100.7	98.2	---
2.	2 c. c.	"	102.3	97.4	100.3	100.8	100.0	99.9	101.6	99.8	101.2	100.7	100.6	100.7	99.7	100.3
3.	1 c. c.	"	102.3	101.6	101.0	101.7	101.1	100.7	100.6	100.8	100.9	100.8	100.9	101.5	100.2	---
4.	2 c. c.	"	102.3	101.0	100.5	101.8	100.8	100.8	100.8	101.5	100.6	100.6	100.8	101.5	101.5	---
5.	2 c. c.	"	102.3	101.2	102.0	101.4	101.1	100.6	100.0	101.2	101.4	100.2	100.3	100.8	100.8	---
6.	2 c. c.	"	102.2	101.8	101.2	101.2	100.8	100.5	100.9	102.3	102.0	100.7	99.8	100.4	100.8	---
7.	2 c. c.	"	101.6	101.7	101.0	100.6	100.4	100.9	101.0	101.0	101.2	100.6	100.2	100.4	101.5	---
8.	2 c. c.	"	101.6	101.1	101.2	101.0	98.8	99.4	100.6	101.3	101.2	99.0	100.2	99.9	100.6	---
9.	2 c. c.	"	100.2	101.0	100.8	101.0	101.2	101.1	100.7	101.2	100.1	100.6	100.8	101.2	100.8	---
10.	2 c. c.	"	99.0	100.6	100.8	101.2	100.8	100.3	100.4	101.6	100.1	101.6	102.9	103.3	102.6	102.6
11.	2 c. c.	"	102.8	102.0	103.0	102.8	101.9	101.2	102.0	102.0	103.2	100.4	101.5	101.8	101.6	---
12.	2 c. c.	"	100.6	102.3	101.4	101.2	100.9	100.6	101.7	100.8	102.0	99.7	101.7	101.8	101.5	---
13.	2 c. c.	"	102.2	101.8	101.4	102.0	101.4	101.7	101.7	100.8	98.3	100.6	100.8	101.0	101.3	---
14.	2 c. c.	"	101.4	102.5	102.4	101.9	101.0	101.3	101.9	101.8	101.6	101.0	101.0	101.2	100.7	---
15.	2 c. c.	"	102.1	102.0	101.3	101.6	102.0	101.4	101.9	102.4	101.6	101.2	101.3	102.0	101.6	100.6
16.	2 c. c.	"	102.1	102.6	102.5	102.6	101.8	101.4	102.2	102.6	101.8	101.4	102.0	102.8	102.8	102.0
17.	2 c. c.	"	101.2	101.2	100.7	101.4	100.4	100.0	101.5	100.4	98.8	101.3	101.4	101.0	100.3	---
18.	2 c. c.	"	101.1	101.3	101.8	98.8	100.2	99.7	101.0	101.9	101.0	99.4	99.2	99.8	99.6	---
19.	2 c. c.	"	101.3	100.4	101.6	101.6	100.4	101.1	102.0	100.7	101.2	101.0	101.0	101.8	101.3	---
20.	2 c. c.	"	101.4	101.4	101.6	102.8	101.0	100.5	102.2	101.3	101.5	101.0	102.0	101.6	101.0	---
21.	2 c. c.	"	101.1	101.3	100.9	100.9	100.6	101.5	102.0	101.0	100.7	99.8	100.7	101.2	100.6	---
22.	2 c. c.	"	99.8	101.0	100.8	101.0	101.2	101.4	100.6	101.7	100.9	101.1	100.8	102.8	102.5	102.5
23.	2 c. c.	"	102.0	102.6	102.9	103.6	102.9	102.8	103.0	103.0	102.2	102.2	102.0	102.8	102.5	---
24.	2 c. c.	"	101.2	101.0	100.2	100.3	100.8	101.0	100.6	102.0	103.0	103.4	103.9	103.8	104.7	104.8
25.	2 c. c.	"	102.1	102.8	102.7	103.0	102.4	104.6	104.8	104.7	104.5	108.4	104.4	104.0	102.6	108.0
26.	2 c. c.	"	99.0	101.2	102.9	101.4	102.0	101.4	100.6	101.4	100.6	100.8	101.9	101.3	102.0	---
27.	2 c. c.	"	101.6	102.7	102.9	101.6	101.1	100.4	101.2	101.6	99.3	99.6	101.1	101.7	101.0	---
28.	2 c. c.	"	101.7	101.0	101.0	101.5	101.0	101.6	101.1	99.8	100.6	100.4	101.0	101.8	101.4	---
29.	2 c. c.	"	101.8	101.2	100.8	101.6	101.3	99.9	100.7	100.7	100.4	100.6	101.2	100.8	100.5	---

\* Test applied by E. A. A. Grange, V. S.

TABLE II.\*

No. of animal.	Am't of in- jection.	Temperatures before injection.		Temperatures after injection.									
		Time of in- jection.	March 31, 1898.				April 1, 1898.						
			8		10		1		4:15		7:45		
			a. m.	p. m.	a. m.	p. m.	a. m.	p. m.	a. m.	p. m.	a. m.	p. m.	
30	2 c. c.	10 p. m.	100.7	101.4	100.2	101.4	101.6	102.0	101.2	102.0	101.2	102.0	6
+31	2 c. c.	"	101.1	100.8	101.4	101.4	102.0	101.4	102.0	101.4	102.0	101.4	
+32	2 c. c.	"	102.0	101.4	100.9	101.4	101.0	100.6	101.0	100.6	101.0	100.6	
+33	2 c. c.	"	102.0	101.3	101.3	101.5	101.4	101.5	101.7	101.7	101.7	101.7	
+34	2 c. c.	"	101.7	101.6	101.6	102.0	101.4	100.8	102.0	101.3	102.0	101.3	6
+35	2 c. c.	"	101.8	101.5	100.9	101.7	100.6	100.6	101.2	101.2	101.2	101.2	
+36	2 c. c.	"	102.3	102.0	101.7	101.4	100.6	100.5	101.4	101.4	101.4	101.4	
+37	1 c. c.	"	101.3	100.7	101.4	100.9	101.8	100.9	101.6	101.6	101.6	101.6	
+38	2 c. c.	"	102.0	102.0	102.0	101.4	101.8	101.8	102.0	101.3	102.0	101.3	6
+39	2 c. c.	"	101.8	101.1	101.2	101.2	102.2	101.4	101.2	101.2	101.2	101.2	
+40	1 c. c.	"	101.0	102.4	102.0	101.7	100.4	101.3	101.6	100.5	101.2	101.2	
+41	2 c. c.	"	100.6	100.8	100.7	100.2	100.2	100.0	100.4	100.4	100.4	100.4	
+42	1 c. c.	"	100.8	101.2	101.5	101.5	101.9	101.0	102.7	102.9	101.3	101.3	6
+43	2 c. c.	"	102.0	100.6	101.1	101.1	101.5	101.4	100.0	100.0	100.5	101.1	
+44	2 c. c.	"	101.0	99.8	100.6	100.6	101.0	101.4	100.9	100.4	99.5	101.2	
+45	2 c. c.	"	102.4	101.4	101.6	101.6	101.0	100.8	100.9	100.9	100.9	100.9	
+46	2 c. c.	"	102.4	101.3	101.4	101.3	101.3	102.0	101.9	102.4	101.6	101.7	6
+47	1 c. c.	"	101.2	101.1	102.0	101.7	100.7	101.2	102.1	102.1	101.3	101.3	
+48	1 c. c.	"	101.2	102.1	101.7	101.7	101.2	101.6	101.4	101.8	101.9	101.9	
+49	1 c. c.	"	100.4	101.3	100.4	100.4	101.3	102.6	101.9	102.7	103.0	103.6	
50	2 c. c.	"	100.8	101.4	101.2	101.2	101.8	100.4	101.1	101.8	101.4	101.4	6
51	1 c. c.	"	101.2	101.4	101.4	101.4	101.2	101.8	101.9	102.0	101.4	101.4	
52	1 c. c.	"	101.0	101.0	101.5	101.5	101.2	101.2	101.6	100.8	101.6	101.6	
53	1 c. c.	"	99.8	102.9	102.4	102.4	100.8	101.4	101.6	102.0	101.5	101.5	
54	1 c. c.	"	108.5	102.1	102.6	102.6	102.6	102.0	102.5	101.1	101.4	101.4	6
55	1 c. c.	"	101.3	100.8	101.2	101.2	102.3	100.8	100.4	100.4	101.3	101.3	
56	1 c. c.	"	100.0	101.0	101.3	101.3	101.1	100.7	101.4	101.0	101.6	101.6	
57	1 c. c.	"	101.0	100.3	101.9	101.9	101.5	101.8	101.4	101.0	101.4	101.4	

\* Test applied by E. A. A. Grange, V. S.

TABLE III.\*

No. of animal.	Temperatures before injection.										Temperatures after injection.									
	May 11, 1906.										May 12, 1906.									
	11 a.m.	1 p.m.	3 p.m.	5:40 p.m.	7:30 p.m.	9:00 p.m.	6 a.m.	7:30 a.m.	8:30 a.m.	9:30 a.m.	10:30 a.m.	11:30 a.m.	1 p.m.	2 p.m.	3 p.m.	4 p.m.	5 p.m.	6:30 p.m.		
19	102.0	102.0	102.0	101.1	100.5	102.1	101.5	101.2	103.2	101.2	100.8	100.4	100.6	101.1	100.9	100.8	101.4	101.0		
2	98.6	100.6	101.3	100.8	101.2	101.2	100.5	100.4	100.5	101.2	100.7	100.2	100.6	100.8	101.3	101.0	101.3	101.0		
30	100.2	100.9	101.2	101.4	101.8	101.8	101.8	102.1	101.4	101.1	102.2	102.6	103.4	102.8	103.8	103.1	102.3	102.7		
24	101.1	102.0	102.3	101.6	101.6	102.4	101.5	101.9	102.6	102.0	102.0	100.1	100.9	101.3	101.2	101.2	101.0	101.3		
47	103.4	101.9	101.8	101.5	101.8	101.6	102.4	103.5	103.3	104.1	104.4	103.6	105.2	106.0	105.2	104.9	103.3	103.7		
51	103.9	103.5	102.8	102.1	102.2	102.3	103.1	104.4	104.3	103.9	103.9	103.6	103.3	103.9	104.5	103.7	102.6	103.1		
17	101.2	101.6	101.7	102.0	101.4	101.4	100.9	101.3	101.0	100.8	100.9	100.9	100.4	100.9	100.4	100.7	101.2	101.2		
21	102.7	102.1	102.5	100.5	102.0	102.3	101.1	102.9	101.5	101.1	102.0	101.1	101.0	101.4	101.0	101.0	101.5	101.3		
54	101.5	102.5	102.8	102.1	102.4	102.7	102.4	102.9	102.7	102.8	104.3	104.1	101.6	101.5	101.8	102.8	102.1	101.4		
25	101.3	101.4	101.4	101.4	101.8	101.4	101.5	101.8	101.8	102.0	101.7	101.8	101.6	102.1	102.4	101.9	101.6	101.7		
38	101.8	102.9	102.6	102.1	102.4	101.6	101.8	102.1	102.1	102.8	101.8	102.0	102.1	101.9	102.3	103.1	101.5	102.1		
50	103.2	101.1	101.7	101.2	101.3	101.2	100.8	101.2	100.3	100.6	100.5	100.3	100.8	100.9	100.8	101.3	101.0	101.4		
16	104.9	103.0	103.3	102.6	102.6	102.6	102.2	101.4	101.6	102.3	102.1	101.6	102.8	103.1	103.6	102.6	102.7	102.6		
60	101.5	101.2	101.9	101.6	102.0	101.6	102.7	101.2	101.3	101.5	101.4	101.4	102.0	102.0	102.0	102.4	102.3	102.3		
45	100.2	100.7	101.2	100.7	100.9	100.8	100.7	100.7	100.1	100.8	100.0	100.4	100.4	99.2	98.4	99.5	98.8	100.0		
29	101.8	100.4	101.4	101.5	101.5	102.1	100.8	101.3	101.6	101.3	101.0	101.3	101.2	101.5	101.4	101.5	101.5	102.5		
56	101.5	101.5	102.2	101.3	101.8	101.5	101.3	101.7	101.4	101.1	102.5	102.4	101.8	103.1	102.4	102.2	102.6	102.5		
37	101.8	101.4	101.8	101.6	101.8	101.5	101.2	101.2	101.2	101.1	101.4	101.1	101.1	101.5	102.3	101.2	101.3	100.8		
15	101.2	101.2	101.2	101.2	101.2	101.2	101.2	101.2	101.2	101.2	101.2	101.2	101.2	101.2	101.2	101.2	101.2	101.2		
64	101.2	101.6	101.6	101.0	102.3	102.3	100.7	102.7	102.3	102.3	102.5	102.1	102.0	101.7	102.1	101.6	101.0	101.2		
65	101.5	101.5	101.5	101.5	102.5	102.2	101.5	101.4	101.7	101.3	102.1	101.4	101.6	101.6	101.6	101.8	102.0	102.2		
66	102.9	101.0	101.0	102.2	102.4	102.2	101.5	102.0	101.8	102.0	100.8	101.6	102.4	101.5	101.4	102.2	100.2	103.5		
63	101.6	101.6	101.6	101.0	102.0	101.6	101.1	101.5	101.7	101.3	101.7	101.4	101.7	101.6	101.3	101.1	101.6	101.6		

\* Test applied by E. A. A. Grange, V. S.

TABLE IV.\*

No. of animal.	Temperatures before injection.					Temperatures after injection.										
	August 19, 1886.					August 20, 1886.										
	8:30 a. m.	1 p. m.	4:30 p. m.	10 p. m.		7 a. m.	8 a. m.	9 a. m.	10 a. m.	11 a. m.	1 p. m.	2 p. m.	3 p. m.	4 p. m.	5 p. m.	7 p. m.
62	101.0	101.1	101.9	† 103.1	102.4	102.1	101.8	101.8	101.8	101.8	102.2	† 101.5	102.2	102.4	† 103.2	102.8
58	† 102.1	102.2	† 102.8	† 102.7	101.9	101.8	† 101.7	101.8	101.9	101.9	102.2	102.5	101.9	102.0	† 102.6	† 102.3
59	† 101.9	102.4	† 103.0	† 103.0	102.4	102.1	101.6	† 101.2	101.7	101.5	101.9	102.4	102.8	102.2	† 102.6	† 102.8
28	† 100.6	† 101.5	† 102.5	† 104.0	102.5	† 101.2	101.5	† 101.3	101.7	101.9	102.4	102.4	102.8	102.9	† 102.5	† 103.0
15	† 101.4	† 101.3	† 101.4	† 101.5	101.4	† 101.4	† 101.4	† 101.2	† 101.6	† 101.5	† 101.7	† 101.7	† 101.2	† 101.6	† 101.6	† 101.5
61	† 101.4	† 102.6	† 105.0	† 103.2	101.5	102.0	101.5	† 101.3	† 101.8	† 101.4	† 102.4	† 102.7	† 102.8	† 102.9	† 103.2	† 102.2
63	† 101.6	† 101.6	† 102.5	† 102.1	101.6	101.6	† 101.3	† 101.3	† 101.5	† 102.0	† 102.5	† 102.4	† 102.5	† 103.2	† 102.6	† 101.5
64	† 101.8	† 101.8	† 102.3	† 101.8	101.2	101.6	† 101.7	† 101.7	† 101.5	† 101.7	† 101.9	† 102.3	† 102.2	† 102.4	† 102.2	† 101.8
65	† 101.3	† 101.6	† 101.9	† 101.2	† 100.8	† 101.0	† 101.0	† 101.0	† 101.0	† 101.3	† 101.2	† 101.8	† 101.7	† 102.2	† 101.8	† 102.0
66	† 103.1	† 101.9	† 102.0	† 102.3	† 101.0	† 101.6	† 101.4	† 101.4	† 101.5	† 102.0	† 101.7	† 102.4	† 102.4	† 102.3	† 103.3	† 102.0
51	101.5	† 101.0	101.5	† 101.7	101.5	101.7	101.7	† 102.3	† 102.3	† 102.0	† 100.6	† 102.2	† 102.0	† 101.4	† 102.0	† 101.6
34	† 101.1	† 101.0	† 101.6	† 101.4	† 101.1	† 101.8	† 101.4	† 101.4	† 100.9	† 100.6	† 101.1	† 101.1	† 101.8	† 101.9	† 101.6	† 101.0
30	† 101.0	† 100.7	† 101.6	† 101.5	† 100.8	† 101.2	† 101.6	† 101.4	† 101.4	† 102.6	† 102.6	† 102.9	† 103.4	† 102.7	† 102.6	† 102.0
† 38	† 101.6	† 101.4	† 101.3	† 101.4	† 104.2	† 104.0	† 103.5	† 103.5	† 103.3	† 103.1	† 103.1	† 103.3	† 104.4	† 103.6	† 103.5	† 103.6
50	† 101.2	† 101.1	† 101.2	† 101.1	† 101.2	† 101.1	† 101.2	† 101.2	† 101.3	† 101.3	† 101.3	† 100.8	† 101.3	† 102.4	† 101.5	† 101.2
45	† 100.2	† 100.0	† 100.4	† 99.5	† 100.0	† 99.3	99.8	† 100.2	† 100.3	† 100.3	† 100.3	† 100.5	† 101.4	† 101.0	† 101.2	† 101.6
37	† 101.6	† 101.5	† 101.9	† 101.9	† 101.7	† 101.7	† 101.7	† 101.9	† 101.9	† 101.3	† 101.3	† 101.9	† 101.4	† 101.7	† 101.7	† 101.4
56	† 101.5	† 101.8	† 102.3	† 102.4	† 101.2	† 101.1	† 100.3	† 100.6	† 101.2	† 101.2	† 101.4	† 101.5	† 101.4	† 101.3	† 101.5	† 101.9

\* Test applied by E. A. A. Grange, V. S.

TABLE V.\*

No. of animal.	Temperatures before Injection.						Temperatures after Injection.									
	August 28, 1896.						August 27, 1896.									
	8 a. m.	11 a. m.	2 p. m.	5 p. m.	10 p. m.		6 a. m.	8:30 a. m.	10 a. m.	11 a. m.	1 p. m.	3 p. m.	4 p. m.	5 p. m.	7 p. m.	
10	98.0	101.4	101.8	102.1	101.6		101.6	101.8	101.6	101.8	102.1	102.8	104.0	105.0	104.4	
41	100.6	100.9	101.6	101.3	101.1		100.9	100.9	101.2	102.0	104.2	104.2	104.8	104.4	103.8	
42	100.5	100.6	101.8	102.2	101.6		101.2	101.2	101.6	101.3	102.5	101.8	104.0	102.5	102.3	
51	99.7	101.4	101.6	102.1	101.6		105.5	106.7	106.6	108.0	106.1	105.8	106.6	106.9	106.2	
54	100.8	101.8	101.4	103.0	101.8		102.1	103.0	102.6	103.4	103.4	103.6	103.6	104.4	103.3	
49	101.1	101.1	102.2	102.2	101.7		101.6	102.3	104.1	105.0	104.4	102.7	105.1	104.7	104.0	
22	100.6	100.7	100.9	102.1	101.7		101.0	100.8	101.3	100.9	101.1	101.4	101.2	102.0	101.4	
38	100.2	101.9	102.1	102.4	101.7		104.2	105.1	106.6	105.8	106.5	105.9	105.8	106.0	106.0	
54	101.2	102.4	102.7	101.9	101.4		101.6	101.8	101.4	101.6	101.8	101.8	102.2	103.1	102.4	
October 20, 1896.																
	9 a. m.	12 n.	3 p. m.	10 p. m.			6 a. m.	8 a. m.	9 a. m.	11 a. m.	1 p. m.	2 p. m.	3 p. m.	4 p. m.	5:30 p. m.	
64	102.4	101.2	101.8	102.0			101.4	101.4	101.4	101.2	101.4	101.0	101.0	102.4	102.0	
65	102.0	101.8	101.0	101.4			102.0	101.4	101.0	101.0	101.0	100.4	100.4	101.6	101.0	
66	102.0	103.4	102.2	101.6		+++	101.4	101.4	101.6	101.0	101.6	101.0	101.3	101.6	101.2	
67	103.0	103.0	103.0	102.8		+++	102.6	102.0	101.2	102.6	101.6	102.0	101.8	102.8	102.0	
68	101.8	102.4	102.6	102.3		+	101.4	101.2	101.2	100.6	101.2	101.4	101.4	101.4	101.0	
69	102.6	102.6	103.0	103.0	+	+	101.6	101.2	102.0	102.4	102.8	102.8	102.8	102.6	102.6	

\* Test applied by E. A. Grange, V. S.



TABLE VI.\*

No. of animal.	Temperatures before injection.						Temperatures after injection.									
	April 20, 1897.						April 21, 1897.									
	8 a.m.	11 a.m.	2 p.m.	4:30 p.m.	8:30 p.m.		6 a.m.	7:30 a.m.	9 a.m.	10 a.m.	11 a.m.	1 p.m.	2 p.m.	3 p.m.	4 p.m.	5 p.m.
6	101.4	101.0	100.2	100.5	99.6	†	99.9	100.2	101.0	101.0	100.9	100.4	101.4	101.0	100.1	100.5
9	101.3	100.9	100.0	100.1	100.0	†	100.6	100.1	100.3	100.3	100.3	100.5	100.7	100.4	100.5	100.8
70	101.6	102.3	100.9	100.7	100.0	†	100.9	101.1	101.3	101.6	101.2	101.0	101.2	101.0	101.4	101.4
5	101.3	100.8	102.0	100.7	99.9	†	101.0	100.9	101.4	102.5	101.8	101.0	102.1	101.9	101.5	100.8
27	101.1	100.9	100.4	99.0	101.4	†	101.0	100.3	100.4	102.3	100.9	100.3	100.4	100.5	100.6	100.8
56	102.3	101.7	101.4	101.7	101.8	†	101.4	101.1	101.6	101.7	101.5	101.0	101.4	101.2	100.9	100.3
57	101.9	102.0	101.6	100.6	100.9	†	101.3	101.4	101.3	100.7	†	101.3	101.4	101.4	101.4	101.1
59	101.8	101.9	101.1	100.8	100.6	†	101.3	101.4	102.2	100.8	101.9	101.4	101.3	101.4	100.6	101.6
53	101.9	101.3	101.8	101.8	101.9	†	101.2	100.9	101.4	102.3	†	101.2	101.3	101.7	101.0	102.1
52	101.6	101.6	100.8	101.8	101.4	†	101.0	101.3	102.3	102.7	101.3	101.9	101.6	101.4	101.7	101.7
37	101.5	101.0	101.5	100.9	101.4	†	101.2	102.4	104.0	105.0	105.1	105.6	105.9	105.4	105.2	104.9
28	101.1	101.2	101.3	100.6	100.4	†	100.9	101.2	100.9	101.3	101.1	101.0	101.3	101.1	101.1	101.0
14	101.9	101.3	101.2	100.2	100.3	†	100.9	101.2	102.3	101.9	101.4	101.4	101.5	101.2	101.3	100.4
46	100.9	101.3	100.5	101.3	100.5	†	100.2	101.5	102.0	102.8	100.4	†	100.4	100.8	100.8	100.6
2	100.1	101.1	101.2	100.9	100.1	†	99.8	101.4	100.3	101.4	100.6	100.8	101.0	100.8	101.4	101.5
71	100.9	101.3	100.6	101.4	101.3	†	100.4	101.3	100.9	100.9	101.2	101.4	100.6	101.3	101.2	100.8
43	99.9	100.0	101.4	101.4	100.9	†	101.5	100.9	100.8	100.7	100.6	†	100.7	100.9	101.4	100.9
44	100.7	100.3	100.6	100.8	100.3	†	100.3	101.3	101.3	100.7	100.6	100.1	100.7	101.0	101.0	101.0
72	102.1	101.9	101.5	101.9	100.4	†	101.2	102.3	101.3	101.4	101.8	101.9	101.2	101.9	102.6	102.5
73	100.8	101.8	101.6	101.9	100.4	†	101.0	101.3	101.2	100.3	101.1	†	101.2	†	102.2	102.1
74	101.7	101.3	100.4	101.5	102.0	†	100.0	101.3	100.5	101.9	101.6	101.5	101.5	†	102.0	101.2
75	100.7	102.1	101.4	101.4	101.0	†	101.8	102.1	†	101.4	†	101.5	101.9	101.6	101.9	101.1
76	102.1	102.1	102.1	102.1	102.1	†	101.4	101.4	101.4	101.8	101.8	102.0	101.9	†	102.0	102.0
68	101.2	102.7	100.7	100.7	101.0	†	101.0	100.7	101.0	101.0	†	†	101.0	101.2	101.0	101.0
69	103.1	102.7	102.2	102.6	103.1	†	101.4	102.2	†	101.0	†	101.8	101.8	102.3	102.3	102.2
57	103.6	102.4	102.4	102.7	101.6	†	101.6	102.3	102.3	101.6	†	100.8	101.2	†	102.4	102.1
77	102.0	103.2	101.9	102.9	101.8	†	101.9	102.5	102.0	102.4	102.5	†	102.1	102.7	102.1	101.8
78	101.7	102.1	102.4	102.1	101.6	†	101.6	101.6	101.9	102.3	†	102.2	102.1	†	101.3	101.8
79	101.0	102.3	101.4	102.0	103.9	†	10.4	101.8	101.9	102.1	101.8	102.2	102.0	†	102.4	101.6
80	100.8	101.4	102.8	101.9	102.8	†	100.0	†	102.3	102.6	101.9	101.7	101.8	†	102.0	101.8

\* Test applied by E. A. Grange, V. S.

TABLE VII.\*

No. of animal.	Temperatures before injection.										Temperatures after injection.									
	April 20, 1897.										April 21, 1897.									
	8:30 a. m.	10:30 a. m.	2 p. m.	4 p. m.	8:30 p. m.	6 a. m.	7:30 a. m.	8:30 a. m.	9:15 a. m.	10 a. m.	10:30 a. m.	1 p. m.	2 p. m.	3 p. m.	4 p. m.	5 p. m.				
81	101.3	102.0	101.9	101.4	101.9	101.5	102.1	101.7	102.3	101.4	101.3	101.0	101.7	102.0	102.0	102.0				
82	102.5	100.8	101.4	103.1	100.6	101.0	101.7	100.6	100.5	100.9	101.6	100.9	101.4	100.6	102.5	102.7				
83	102.2	101.7	100.4	100.1	100.4	101.2	100.7	100.8	100.4	102.6	101.8	100.4	101.0	100.6	101.1	101.1				
84	100.7	100.5	100.3	101.1	100.8	100.6	101.5	100.8	100.7	100.9	100.9	101.4	100.8	107.1	106.3	104.4				
85	100.7	100.5	100.4	101.1	100.8	100.6	101.3	100.6	101.0	101.1	101.1	100.8	100.8	100.4	100.8	101.2				
86	101.6	101.2	100.8	100.8	101.1	101.2	100.7	100.5	100.8	101.2	100.4	101.3	101.3	101.0	101.4	101.0				
87	101.5	100.9	101.5	101.1	100.8	101.2	102.1	101.5	101.3	102.0	101.1	101.2	101.3	101.0	101.6	101.5				
88	101.2	100.0	101.4	101.4	100.8	101.0	100.6	100.8	101.0	101.1	101.1	100.8	100.6	100.9	100.8	101.4				
89	101.2	101.0	100.9	100.5	100.6	100.7	101.0	100.6	100.8	101.2	101.0	101.1	101.0	100.6	100.8	101.4				
90	101.2	101.5	100.9	100.9	100.6	100.7	101.0	100.6	100.8	101.2	101.0	101.1	101.0	100.6	100.8	101.4				
91	101.2	101.5	100.9	100.9	100.6	100.7	101.0	100.6	100.8	101.2	101.0	101.1	101.0	100.6	100.8	101.4				
92	100.9	101.3	100.5	100.9	101.2	100.8	101.0	100.6	100.8	101.2	101.0	101.1	101.0	100.6	100.8	101.4				
93	100.7	101.0	100.5	100.9	101.2	100.8	101.0	100.6	100.8	101.2	101.0	101.1	101.0	100.6	100.8	101.4				
94	100.7	101.0	100.5	100.9	101.2	100.8	101.0	100.6	100.8	101.2	101.0	101.1	101.0	100.6	100.8	101.4				
95	101.6	100.4	101.7	102.5	102.0	100.4	101.6	100.9	100.3	100.4	100.4	101.3	101.3	101.1	101.5	101.0				
96	101.6	100.4	101.7	102.5	102.0	100.4	101.6	100.9	100.3	100.4	100.4	101.3	101.3	101.1	101.5	101.0				
97	101.6	100.4	101.7	102.5	102.0	100.4	101.6	100.9	100.3	100.4	100.4	101.3	101.3	101.1	101.5	101.0				
98	100.9	102.3	101.9	101.4	100.6	100.5	102.2	101.2	101.3	100.7	100.7	100.9	100.6	100.4	101.4	101.5				
99	100.9	102.3	101.9	101.4	100.6	100.5	102.2	101.2	101.3	100.7	100.7	100.9	100.6	100.4	101.4	101.5				
100	102.0	100.6	101.4	101.0	101.3	101.2	102.2	101.9	101.6	101.6	101.6	101.8	103.2	103.4	102.8	103.0				
101	102.4	101.8	102.3	101.4	100.6	101.4	101.2	101.9	101.6	101.6	101.6	101.8	103.2	103.4	102.8	103.0				
102	101.4	101.4	102.0	102.2	100.6	100.9	100.3	100.8	100.4	101.0	101.0	101.0	101.2	101.4	101.2	101.9				

June 9, 1897.										June 10, 1897.									
8:30 a. m.	11 a. m.	2:30 p. m.	5 p. m.	8 p. m.	4:15 a. m.	5 a. m.	6 a. m.	7 a. m.	9:30 a. m.	10:30 a. m.	11:45 a. m.	1:15 p. m.	2:30 p. m.	4 p. m.	5 p. m.				
83	102.0	101.3	102.2	101.4	101.8	101.4	100.8	101.6	101.8	101.8	102.1	102.3	101.6	101.0	101.2				
84	100.8	100.9	101.6	101.7	101.9	101.2	101.0	100.6	100.7	100.7	100.5	103.2	103.4	102.8	103.0				
85	102.4	101.8	102.3	101.4	101.3	101.4	101.2	101.9	101.6	101.6	101.8	101.6	101.6	101.6	101.9				

August 5, 1897.										August 6, 1897.									
8 a. m.	10 a. m.	2 p. m.	5:10 p. m.	8:20 p. m.	4:15 a. m.	5:15 a. m.	6:15 a. m.	7:15 a. m.	8:45 a. m.	9:45 a. m.	11 a. m.	1:15 p. m.	3:15 p. m.	4:15 p. m.	5:15 p. m.				
85	97.2	97.9	100.2	100.1	101.0	100.0	100.8	99.8	100.6	102.0	01.8	101.4	101.5	101.4	101.3				

\* Test applied by E. A. Grange, V. S.

TABLE VIII.\*

No. of animal.	Temperatures before injection.							Temperatures after injection.						
	April 22, 1897.							April 23, 1897.						
	9:30 a.m.	10:30 a.m.	2 p.m.	4 p.m.	8:30 p.m.	6 a.m.	8 a.m.	9 a.m.	10 a.m.	11 a.m.	1 p.m.	2 p.m.	4 p.m.	5 p.m.
+10.....	+ 101.5	101.1	101.0	101.3	101.4	101.0	101.2	101.2	101.9	101.1	101.4	104.6	103.2	102.8
41.....	100.4	100.8	98.1	100.2	101.4	101.6	101.6	102.0	101.3	100.8	102.8	105.0	103.1	101.0
31.....	99.6	101.4	100.7	99.8	100.4	103.0	108.0	104.6	105.5	105.1	103.4	105.0	103.0	108.0
83.....	102.4	101.5	101.3	101.2	100.4	108.2	108.0	105.4	105.2	104.8	105.2	105.0	105.0	108.6
24.....	101.8	101.7	100.6	100.9	100.5	101.6	102.1	102.4	102.9	101.8	101.0	101.2	102.2	102.0
22.....	101.8	100.7	101.4	100.9	100.1	101.5	101.5	101.2	100.4	100.6	100.6	100.6	101.6	101.0
33.....	101.6	100.8	101.6	101.0	100.6	105.2	104.0	105.4	105.9	105.7	104.8	104.8	105.0	104.8
30.....	100.0	100.7	101.1	100.4	101.2	101.0	100.0	101.6	101.3	102.4	104.6	104.6	104.0	104.0
49.....	102.4	100.5	101.0	101.3	100.6	101.0	100.5	100.4	100.9	101.4	101.8	101.6	101.4	101.2
38.....	100.7	101.2	100.8	100.9	100.6	100.2	100.5	101.0	100.8	100.6	100.6	101.2	101.2	100.1
42.....	101.0	101.5	101.4	102.2	102.6	102.0	101.0	101.0	101.5	102.0	102.4	102.4	101.6	101.2

TABLE IX.

No. of animal.	Normal temperatures.							Normal temperatures.						
	September 3, 1897.							September 4, 1897.						
	8 a.m.	9 a.m.	10 a.m.	11 a.m.	1 p.m.	2 p.m.	3 p.m.	4 p.m.	5 p.m.	7 a.m.	8 a.m.	9 a.m.	10 a.m.	11 a.m.
86.....	+ 101.6	103.0	102.3	102.5	102.6	101.7	102.2	102.1	102.8	101.5	101.6	101.6	101.6	101.6
87.....	101.6	101.6	101.0	101.5	101.7	101.7	102.2	102.6	102.6	101.7	101.7	101.6	101.6	101.6
88.....	101.2	101.4	101.0	101.4	101.3	101.5	101.5	101.9	101.6	101.7	101.0	101.4	101.4	101.8
89.....	100.8	100.7	100.6	100.3	100.2	100.4	100.4	100.7	100.9	100.5	100.9	100.5	100.9	101.8
90.....	101.5	101.3	101.2	101.1	101.5	101.6	101.6	101.9	101.6	101.5	101.5	101.5	101.5	100.9
91.....	101.5	101.3	101.2	101.1	101.5	101.6	101.6	101.9	101.6	101.5	101.5	101.5	101.5	102.2
92.....	101.5	101.3	101.2	101.1	101.5	101.6	101.6	101.9	101.6	101.5	101.5	101.5	101.5	101.8
93.....	101.6	101.4	101.3	101.2	101.5	101.6	101.6	101.9	101.6	101.5	101.5	101.5	101.5	101.8
94.....	102.0	101.7	101.5	101.5	101.6	101.6	101.6	101.9	101.6	101.5	101.5	101.5	101.5	101.8
95.....	102.0	101.7	101.5	101.5	101.6	101.6	101.6	101.9	101.6	101.5	101.5	101.5	101.5	101.8
96.....	102.4	103.4	102.2	102.0	102.4	102.2	102.2	102.6	102.6	102.6	102.6	102.6	102.6	102.6
97.....	102.4	103.4	102.2	102.0	102.4	102.2	102.2	102.6	102.6	102.6	102.6	102.6	102.6	102.6
98.....	101.0	101.0	101.0	101.0	101.0	101.0	101.0	101.0	101.0	101.0	101.0	101.0	101.0	101.0
99.....	102.2	101.0	100.6	102.1	102.1	101.9	101.7	102.1	102.1	101.6	101.6	101.9	101.9	102.0
100.....	+ 102.4	101.3	101.7	102.2	102.2	102.0	101.9	101.9	101.9	101.3	101.3	101.5	101.5	101.1

\* Test applied by E. A. A. Grange, V. S.

TABLE X.

No. of animal.*	Am't in- jected.	Temperature before injection.										Temperature after injection.									
		September 5, 1897.										September 7, 1897.									
		9	10	11	1	2	3	4	5	6	7	8	9	10	11	12 n.	1	2	3	4	5
		a. m.	a. m.	a. m.	p. m.	p. m.	p. m.	p. m.	a. m.	a. m.	a. m.	a. m.	a. m.	a. m.	a. m.		p. m.	p. m.	p. m.	p. m.	p. m.
86	2 c. c.	101.2	+100.6	100.8	+100.6	101.3	101.6	101.4	+102.0	100.8	100.8	100.6	100.5	100.6	+100.4	100.8	101.0	100.8	101.2	101.7	+101.9
87	"	101.1	+100.4	100.7	101.2	101.7	101.9	102.0	+102.5	100.7	100.5	+100.4	100.9	100.6	100.8	101.0	100.9	101.8	101.3	102.0	+102.3
88	"	100.8	+100.8	100.7	101.0	100.9	101.3	101.9	+102.3	100.4	101.2	+100.2	100.8	101.0	100.9	100.6	101.3	101.1	101.7	102.0	+101.9
89	"	+100.5	+100.5	+100.5	101.0	101.4	101.1	101.9	+102.4	101.1	101.0	100.5	101.0	100.8	+100.4	101.0	101.1	101.1	101.2	101.4	+102.3
90	"	+100.1	100.3	100.2	100.6	100.8	100.8	101.7	+102.2	+100.0	100.9	+100.0	100.7	100.5	100.7	100.5	100.7	100.7	101.1	100.8	+101.2
91	"	+100.2	101.2	101.0	101.4	101.6	102.3	+102.4	101.3	+100.1	100.7	100.5	100.5	100.8	100.6	101.2	101.4	100.6	101.3	101.8	+102.6
92	"	+100.6	+100.6	100.7	100.9	101.5	101.4	102.0	+102.1	100.3	101.0	100.6	100.9	100.8	100.7	101.1	101.3	100.8	101.4	100.9	+102.2
93	"	+100.6	101.1	101.1	101.6	101.6	+102.1	101.6	+100.6	+100.6	100.6	100.8	101.1	100.7	101.1	100.9	101.0	+101.5	101.4	101.3	101.4
94	"	100.8	+100.7	101.0	101.3	101.1	102.2	+102.6	+101.0	101.5	101.9	101.4	101.3	101.2	101.7	102.2	101.7	102.5	102.9	102.5	+103.0
95	"	+100.7	+100.0	100.9	101.0	101.5	101.6	101.5	+102.4	+100.2	100.4	100.8	100.7	100.6	100.4	101.1	100.9	101.4	100.9	+101.7	101.5
96	"	101.9	+100.7	100.9	101.5	101.9	+102.1	+102.2	+100.8	101.3	101.3	101.1	101.1	101.3	101.0	101.1	101.1	101.7	101.6	101.6	+101.8
97	"	+101.7	101.9	101.9	101.8	+103.4	103.1	+103.4	+100.6	102.1	101.1	101.8	101.5	101.0	102.0	102.3	102.0	102.6	102.6	+102.9	102.6
98	"	+100.4	100.5	100.8	101.0	101.2	101.5	101.6	+102.4	100.5	100.4	101.3	101.2	+100.9	+100.3	100.7	101.2	101.5	101.3	101.5	+101.7
99	"	+100.1	100.5	100.8	101.2	101.8	102.2	102.0	+102.7	+100.4	100.6	101.1	100.6	100.8	100.8	101.3	101.8	102.2	+102.3	102.2	+102.3
100	"	101.1	+100.7	101.3	101.6	101.8	101.9	101.4	+102.4	100.8	+100.2	101.5	101.2	100.9	101.0	101.7	101.3	101.7	101.6	+101.9	+101.9

\* Injection made at 8 p. m., September 6, 1897.

TABLE XI.

No. of animal.	Normal temperatures.										Normal temperatures.									
	October 12, 1897.										October 13, 1897.									
	8 a. m.	9 a. m.	10 a. m.	11 a. m.	1 p. m.	2 p. m.	3 p. m.	4 p. m.	5 p. m.		8 a. m.	9 a. m.	10 a. m.	11 a. m.	1 p. m.	2 p. m.	3 p. m.	4 p. m.	5 p. m.	
9	99.8	100.3	100.7	100.7	100.9	101.2	101.2	101.4	100.6		100.1	100.4	100.6	100.2	100.5	101.4	100.8	100.3	100.8	
7	100.7	100.9	100.2	101.0	101.1	101.2	101.3	101.2	101.3		99.3	100.2	100.6	101.2	100.8	101.4	101.3	101.1	101.8	
13	101.2	101.2	101.3	101.3	101.5	101.6	101.7	101.7	101.8		101.1	100.3	100.2	99.9	100.4	100.7	100.4	99.7	99.8	
14	102.2	101.2	101.3	101.3	101.5	101.5	101.7	101.7	101.8		100.8	101.1	100.9	101.2	101.0	101.5	101.4	101.1	101.7	
17	100.8	100.1	100.3	100.0	100.7	100.5	100.6	100.8	100.5		99.8	100.3	100.2	100.4	100.8	100.4	100.5	100.4	100.8	
16	100.7	101.0	100.4	100.4	100.1	101.0	101.5	101.6	101.4		101.5	100.5	100.1	100.8	100.3	101.0	101.5	101.5	101.2	
21	101.3	100.6	101.3	101.2	101.7	102.1	102.1	102.4	102.1		102.0	101.4	100.8	101.1	101.2	101.7	102.2	101.7	101.6	
23	100.6	100.8	99.2	101.0	100.1	100.3	100.9	101.1	100.9		100.8	100.2	101.1	100.4	100.6	100.6	101.3	100.7	100.6	
59	101.7	101.4	101.4	100.7	100.7	101.1	101.0	101.1	100.7		101.3	100.6	101.2	100.7	101.0	100.6	101.4	101.0	101.5	
52	101.5	101.4	101.0	100.8	101.3	101.1	101.6	101.4	102.3		101.1	100.8	100.2	100.7	99.9	100.8	101.3	101.6	101.3	
53	101.2	100.2	100.6	100.7	100.4	101.5	101.3	101.1	101.4		100.8	101.2	100.9	100.9	101.1	101.0	101.5	101.7	101.6	
75	101.0	101.0	100.2	100.8	100.4	100.5	100.9	101.0	101.3		99.7	100.2	100.2	100.8	99.7	100.4	100.5	100.7	101.4	
5	101.3	101.4	101.3	100.8	101.4	101.3	101.8	101.8	101.8		101.1	100.0	99.6	100.8	101.0	100.5	101.3	100.4	100.9	
109	99.3	100.0	100.3	100.1	100.9	101.0	100.6	100.9	100.6		100.2	100.3	100.1	100.3	100.4	100.0	101.3	101.0	100.4	
111	101.1	100.5	100.4	100.4	101.3	101.2	101.1	101.4	101.2		100.3	100.7	100.4	100.6	100.2	100.1	101.6	101.7	102.3	
110	101.1	101.2	100.9	101.0	101.1	101.3	100.9	102.4	102.0		101.3	101.7	101.0	100.6	101.7	100.8	101.4	101.6	101.4	
107	101.3	101.1	101.2	101.2	101.1	101.0	101.3	101.3	101.4		101.3	99.7	100.8	101.1	100.8	101.0	101.0	100.9	100.7	
108	100.7	100.0	100.0	100.0	100.3	101.0	100.5	101.1	101.3		101.3	99.8	100.0	101.0	99.7	99.8	100.5	101.4	101.4	
101	101.1	99.5	99.5	100.7	100.7	100.4	100.9	100.5	100.2		101.6	101.4	100.5	99.8	100.6	100.1	100.2	99.7	100.5	
103	101.7	101.3	101.5	101.4	100.0	101.0	101.4	100.7	100.5		101.1	101.1	100.0	99.8	100.6	100.2	101.1	101.3	100.4	
106	101.4	101.1	100.9	100.7	101.8	100.9	101.1	101.1	101.4		101.0	100.8	101.4	100.2	101.2	101.0	101.9	101.7	102.4	
104	101.4	100.8	100.4	100.9	100.9	100.8	100.7	100.6	100.9		100.6	100.1	100.6	99.9	99.2	100.6	100.7	101.3	100.9	
105	101.3	100.9	100.0	101.0	100.7	101.1	100.6	100.8	101.0		101.2	100.1	100.9	100.2	100.3	100.3	100.8	100.8	100.1	
112	100.0	100.5	100.7	100.5	101.2	101.4	102.3	101.0	101.6		98.5	100.0	99.0	100.2	100.7	101.0	100.3	101.8	101.0	
113	100.5	101.9	100.8	103.2	102.8	102.4	102.6	102.0	102.4		92.4	100.4	101.1	101.9	101.4	101.9	102.1	102.6	102.9	
114	100.8	101.8	101.7	101.5	102.0	102.0	103.0	101.0	101.9		98.3	99.4	101.1	100.6	101.4	101.2	101.6	101.9	101.0	
115	100.8	102.0	101.1	101.4	102.1	103.8	102.7	101.6	101.7		98.4	100.0	100.6	101.1	100.8	101.2	102.6	101.8	102.3	
44	100.1	100.0	99.3	100.1	100.1	100.5	100.7	101.3	100.7		98.6	97.8	97.1	97.8	98.2	99.0	99.1	100.0	100.3	

TABLE XII.

No. of animal.	Am't in-jected.	Temperatures before injection.										Temperatures after injection.									
		October 13, 1897.										October 14, 1897.									
		8 a.m.	9 a.m.	10 a.m.	11 a.m.	1 p.m.	2 p.m.	3 p.m.	4 p.m.	5 p.m.	5 a.m.	7 a.m.	8 a.m.	9 a.m.	10 a.m.	11 a.m.	1 p.m.	2 p.m.	3 p.m.	4 p.m.	5 p.m.
99	2 c. c.	100.1	100.4	100.6	100.2	100.5	101.4	100.8	100.3	100.8	101.2	100.7	100.6	101.0	101.1	101.2	101.2	101.4	102.0	101.4	
100	"	99.3	100.2	100.6	101.2	100.8	101.4	101.3	101.1	101.6	101.2	100.7	101.3	101.4	101.6	101.9	102.1	102.2	102.7	101.7	
101	"	101.1	100.3	100.2	99.9	100.4	100.7	100.4	99.7	99.8	100.6	100.5	100.5	101.3	100.9	101.3	101.3	101.0	101.1	101.6	
102	"	100.8	101.1	100.9	101.2	101.0	101.5	101.4	101.1	101.7	101.0	100.7	100.8	101.5	101.4	101.8	102.0	101.7	101.7	102.6	
103	"	99.8	100.3	100.2	100.4	100.8	100.4	100.5	100.4	100.8	100.8	100.7	100.6	101.3	101.5	101.6	101.7	101.7	101.7	101.4	
104	"	101.5	100.5	100.1	100.8	100.3	101.0	101.5	101.5	101.2	100.7	100.6	101.3	101.4	101.6	101.9	102.1	102.2	102.7	101.7	
105	"	102.0	101.4	100.8	101.1	101.2	101.7	102.2	101.7	101.6	101.8	101.6	101.3	101.4	101.6	101.9	102.1	102.2	102.7	101.7	
106	"	100.8	100.2	100.1	100.4	100.6	101.6	101.3	101.0	100.4	101.2	101.7	102.9	103.0	104.1	103.8	102.8	102.8	101.6	101.6	
107	"	101.3	101.7	101.0	100.6	101.7	100.8	101.4	101.6	101.4	101.8	102.1	102.3	101.4	101.5	101.8	102.1	102.7	102.9	103.0	
108	"	100.5	99.7	100.8	100.1	100.8	101.0	101.0	101.0	100.9	100.7	100.7	100.7	101.2	101.2	101.2	101.2	101.2	101.2	101.0	
109	"	101.3	99.8	100.0	101.0	99.7	99.8	101.0	100.5	101.3	100.4	100.9	102.2	103.9	103.0	104.1	103.8	102.8	102.8	101.0	
110	"	100.6	100.5	100.9	100.4	100.6	100.1	100.2	99.7	100.5	100.8	101.2	101.0	101.0	100.8	100.7	100.9	100.9	100.9	101.3	
111	"	101.4	101.1	100.0	99.8	100.6	100.2	101.1	101.3	101.0	100.5	101.1	101.1	100.4	100.6	100.5	101.8	101.8	101.8	101.3	
112	"	101.0	100.8	101.4	100.2	101.2	101.0	101.0	101.7	102.4	101.3	101.5	101.0	100.8	101.1	101.3	101.6	102.6	102.9	103.0	
113	"	101.0	100.6	100.4	99.9	99.2	100.6	100.7	101.3	100.9	100.3	100.7	100.4	100.3	100.1	100.7	100.4	101.2	101.2	101.2	
114	"	101.2	101.1	100.9	100.2	100.3	100.8	100.6	100.6	100.1	101.0	101.6	101.2	101.0	100.8	101.1	101.5	101.5	101.5	101.2	
115	1 c. c.	98.5	100.0	99.0	100.2	100.7	101.0	100.3	101.8	101.0	99.8	101.4	101.4	101.4	101.5	102.0	102.6	102.6	103.6	103.4	
116	"	99.4	100.4	101.1	101.9	101.4	101.9	102.1	102.6	102.9	101.7	101.8	102.0	103.0	103.3	103.6	104.1	104.4	104.4	103.8	
117	"	99.3	99.4	100.1	100.6	101.4	101.2	101.6	101.9	101.4	100.3	101.3	101.9	101.4	101.6	102.2	102.2	103.2	103.5	103.6	
118	"	99.4	100.0	100.6	101.1	100.8	101.2	102.6	102.6	101.8	102.3	102.5	102.0	102.1	102.6	102.5	103.2	103.6	103.6	103.6	
119	"	98.6	97.8	97.1	97.8	98.2	99.0	99.1	99.1	98.2	99.0	99.0	99.8	101.0	100.2	100.8	101.1	100.4	101.3	101.6	
120	2 c. c.	98.6	97.8	97.1	97.8	98.2	99.0	99.1	100.0	100.3	100.7	101.0	101.3	101.6	101.9	102.1	102.1	102.1	102.1	101.6	

TABLE XIII.

No. of animal.	Am't injected.	Temperatures before injection.										Temperatures after injection.									
		October 13, 1897.										October 14, 1897.									
		9 a.m.	10 a.m.	11 a.m.	2 p.m.	3 p.m.	4 p.m.	5 p.m.	5 a.m.	7 a.m.	8 a.m.	9 a.m.	10 a.m.	11 a.m.	1 p.m.	2 p.m.	3 p.m.	4 p.m.	5 p.m.		
+4	2 c. c.	99.2	101.1	101.7	+ 101.9	101.5	101.8	100.9	+ 102.7	100.9	102.0	101.2	101.1	+ 100.8	102.3	101.6	102.0	102.4	101.8		
+10	"	+ 100.5	101.6	101.3	100.8	101.7	101.3	101.2	101.2	101.4	101.1	101.1	+ 101.1	101.4	102.0	101.8	101.5	102.0	+ 102.3		
+21	"	101.7	100.5	102.2	102.6	103.0	+ 103.3	103.3	102.3	103.3	102.2	103.1	103.2	103.1	103.0	104.1	104.2	+ 104.6	103.7		
+24	"	102.2	102.5	102.5	102.5	102.8	101.9	+ 101.3	+ 100.4	101.7	101.8	101.3	100.6	100.9	101.2	101.5	101.6	+ 101.5	+ 102.2		
+22	"	+ 101.6	99.9	+ 100.9	101.2	101.4	101.0	101.4	+ 100.6	100.3	99.9	99.9	+ 99.8	100.4	101.0	100.8	101.0	+ 101.9	101.7		
+33	"	+ 99.9	100.3	+ 102.2	100.9	101.3	102.0	99.5	102.4	102.4	102.5	103.0	103.2	103.9	+ 104.4	103.6	103.1	+ 102.6	101.7		
+30	"	101.6	100.9	101.7	101.5	102.0	102.2	101.6	103.1	101.9	102.4	103.3	104.0	104.5	105.3	103.8	105.6	+ 105.8	105.1		
+49	"	101.5	100.5	102.1	+ 102.6	+ 102.6	10.8	102.0	105.2	104.9	104.9	105.2	105.7	105.7	105.9	105.4	105.0	+ 104.0	104.1		
+32	"	101.6	99.9	101.6	102.5	102.3	102.0	101.6	104.2	104.0	103.7	105.2	105.3	105.6	105.4	104.9	101.6	+ 105.0	104.4		
+26	"	+ 100.7	100.6	100.1	+ 100.0	100.2	100.4	100.3	101.6	+ 101.3	102.8	105.5	+ 106.1	105.6	104.7	105.4	105.7	105.9	105.7		
+83	"	98.8	99.5	102.0	101.5	102.2	101.4	101.4	104.2	104.4	104.9	105.1	105.6	104.9	105.1	105.6	105.0	+ 104.8	104.1		
+42	"	99.6	99.4	+ 101.9	101.6	101.8	101.3	100.5	104.4	105.2	105.2	105.4	103.7	105.8	105.2	104.7	104.4	+ 104.0	102.5		
+37	"	+ 100.8	101.2	101.8	101.8	101.7	+ 102.0	101.2	+ 100.8	101.7	101.8	101.4	101.3	+ 100.9	102.3	102.8	102.1	+ 103.0	102.5		

\* Injection made at 8 p. m., October 13, 1897.

TABLE XIV.

No. of animal.	Normal temperatures.										Normal temperatures.									
	March 23, 1898.										March 28, 1898.									
	8 a.m.	9 a.m.	10 a.m.	11 a.m.	1 p.m.	2 p.m.	3 p.m.	4 p.m.	5 p.m.	7 a.m.	8 a.m.	9 a.m.	10 a.m.	11 a.m.	1 p.m.	2 p.m.	3 p.m.	4 p.m.	5 p.m.	
129	101.0	101.0	99.7	100.2	101.4	100.3	100.2	100.7	101.6	100.7	100.7	101.0	101.8	99.7	100.2	99.1	100.8	101.3	100.3	
130	100.2	100.7	101.5	100.2	100.8	99.8	101.0	99.5	100.0	101.7	100.9	102.5	99.2	101.6	100.9	101.5	101.6	102.3	100.7	
131	100.7	99.3	101.9	101.9	100.1	100.9	100.1	100.3	100.1	101.4	99.3	101.4	101.7	101.0	100.9	100.6	100.6	102.6	102.5	
132	101.3	100.5	102.4	101.0	99.8	103.1	102.0	102.4	101.1	103.1	102.4	102.5	102.0	101.3	102.7	101.7	103.0	101.9	102.8	
45	98.8	97.3	96.8	96.9	98.3	97.8	93.4	97.8	97.5	99.0	96.0	98.4	98.9	97.9	98.7	97.9	98.6	99.0	99.2	
128	100.8	102.0	99.9	99.8	100.6	99.3	93.1	98.7	100.8	99.3	98.3	98.3	98.4	101.0	100.6	99.7	99.4	100.2	101.0	
127	102.3	99.6	101.0	98.6	99.4	97.8	99.1	98.6	100.8	98.8	98.5	98.5	98.3	97.8	98.3	98.9	98.0	98.1	98.9	
44	98.0	97.4	97.5	98.3	99.4	98.2	98.0	98.5	98.5	97.3	97.3	98.7	98.1	98.8	98.3	98.0	98.0	98.1	98.9	
125	100.7	98.0	100.6	100.5	101.1	100.3	98.5	102.4	100.3	102.5	103.1	103.0	101.6	101.7	101.3	100.3	99.9	101.3	101.3	
43	97.7	99.1	96.4	99.8	99.2	97.4	98.2	97.4	98.0	99.7	99.9	98.0	98.6	98.0	98.0	98.6	98.3	97.7	98.5	
123	100.9	101.2	101.0	99.3	98.9	100.5	100.3	101.8	100.4	101.2	101.4	99.6	99.3	99.1	99.7	99.3	100.2	100.2	98.2	
124	99.3	100.3	98.1	99.7	99.2	98.3	99.9	100.1	100.2	98.5	99.4	98.2	98.9	98.9	98.1	99.6	98.6	97.9	101.1	
124	101.0	99.3	101.3	100.6	99.2	98.3	101.3	103.4	99.2	101.2	101.7	101.1	100.0	100.0	100.7	100.4	98.0	100.4	98.3	
122	101.9	101.8	100.6	100.0	102.2	100.3	99.1	100.9	101.8	98.4	101.1	100.9	99.9	98.7	100.7	98.4	98.0	98.2	98.5	
52	97.9	98.6	96.9	98.3	98.9	97.4	97.6	93.2	97.8	98.4	100.2	97.3	101.0	99.2	99.3	98.7	99.5	99.1	99.6	
121	99.4	101.0	100.3	101.2	100.3	100.6	99.5	100.1	100.5	100.3	100.9	100.5	100.7	101.4	99.0	100.1	100.8	101.3	100.2	
53	100.7	102.0	99.4	99.4	100.8	100.0	101.2	102.0	99.3	99.3	103.6	103.2	102.0	102.0	101.2	103.7	102.3	100.9	98.3	
133	101.6	98.5	97.5	98.7	99.2	97.1	98.2	98.1	99.8	99.8	100.5	100.3	98.3	98.8	101.9	100.7	100.1	98.8	98.3	
112	99.9	99.5	97.2	98.5	99.3	98.4	97.6	99.1	98.1	101.6	100.2	98.2	98.2	99.6	97.3	99.4	100.3	98.0	98.1	
113	100.5	100.5	99.3	98.4	101.8	100.3	99.9	100.4	100.1	101.8	100.2	98.2	100.7	97.3	97.3	99.6	100.5	98.1	100.6	
120	100.5	100.2	101.2	100.6	100.4	101.0	100.3	101.5	99.4	101.8	101.0	98.3	100.0	98.7	98.0	98.0	100.2	100.5	100.7	
68	99.8	98.4	91.5	98.0	98.7	98.3	98.2	98.4	98.6	98.3	97.3	97.4	98.6	98.7	98.1	98.5	98.4	98.2	98.0	
114	98.4	101.1	99.2	99.8	97.0	100.3	98.3	100.1	102.2	98.8	100.5	99.9	98.1	97.5	98.4	99.9	98.6	98.7	97.1	
117	99.9	99.9	99.9	100.6	95.8	99.2	99.6	99.6	99.9	99.1	103.1	102.4	100.4	101.7	102.1	101.8	102.4	99.3	102.5	
119	93.6	98.7	99.3	99.6	99.6	100.0	98.4	99.7	100.1	100.7	100.0	99.2	98.4	99.1	99.8	98.5	98.7	99.2	100.4	
70	99.3	99.3	97.5	98.0	97.1	98.9	100.2	100.6	98.6	98.9	98.2	98.2	100.0	99.1	97.3	98.2	98.5	98.3	99.6	
115	101.2	100.7	99.9	101.0	101.8	100.8	99.2	100.6	101.1	100.3	100.0	100.6	100.4	99.8	98.2	98.7	98.5	98.5	99.7	
118	98.6	98.7	98.0	100.4	102.2	98.3	98.2	99.7	100.4	99.8	98.8	98.7	99.7	100.8	99.3	99.6	93.4	96.4	99.9	



TABLE XV.

No. of animal.	Am't in- jected.	Temperatures before injection.										Temperatures after injection.													
		March 31, 1898.										April 1, 1898.													
		7	8	9	10	11	1	2	3	4	5	4	5	6	7	8	9	10	11	1	2	3	4	5	
*29	1 c.	101.7	101.2	100.6	101.0	101.3	101.0	+100.4	100.7	+102.1	102.0	101.7	+101.9	100.6	100.4	100.7	101.4	100.5	+100.1	100.9	101.0	101.0	101.0	101.0	100.1
130	"	+99.9	100.2	101.1	101.8	100.6	101.2	100.3	101.6	+102.6	102.0	100.1	101.7	100.1	99.9	100.6	101.6	100.5	100.1	100.5	100.1	100.1	101.5	99.6	99.6
131	"	101.1	100.9	98.8	100.0	101.6	101.2	100.8	100.0	+102.2	102.0	101.1	101.7	100.1	99.8	100.3	101.6	100.1	100.3	98.7	99.3	100.2	100.8	101.1	101.1
132	"	102.0	100.8	98.7	100.3	100.2	100.9	+102.2	100.6	101.4	101.4	102.9	100.8	101.1	102.5	102.3	101.1	100.3	98.5	98.7	99.3	100.2	100.5	102.5	102.5
127	"	+96.6	98.1	100.3	100.8	100.0	101.4	101.9	100.8	99.2	99.1	100.6	98.7	98.0	99.0	100.0	99.5	100.1	100.6	98.1	97.0	97.3	98.2	98.2	98.2
128	"	+102.3	101.0	99.9	100.1	99.6	99.0	+98.1	98.8	100.1	99.5	99.9	99.1	100.3	98.5	98.0	+100.9	98.5	98.6	99.0	99.5	100.7	97.8	97.8	97.8
125	"	99.4	98.9	99.6	100.0	100.6	101.2	100.8	100.8	100.3	100.4	99.4	100.7	99.9	99.2	100.1	100.6	100.9	100.2	100.9	99.2	101.1	99.2	101.2	101.2
126	"	100.6	100.2	100.1	101.1	99.0	100.1	98.9	99.8	+101.3	99.7	99.2	99.2	101.0	100.4	100.6	100.9	100.9	97.5	99.8	99.5	100.1	100.0	101.2	101.2
123	"	99.5	101.7	99.7	99.0	99.4	98.5	98.9	100.1	99.8	100.4	98.8	100.6	101.3	101.5	100.8	101.1	100.7	99.6	99.8	99.8	99.6	100.2	99.4	99.4
124	"	+100.7	100.3	99.3	100.0	98.5	99.8	99.7	100.1	98.8	+93.3	98.5	99.9	99.3	99.3	100.6	98.5	100.3	94.4	+102.3	99.1	99.6	100.2	100.4	100.4
122	"	99.7	98.6	98.5	99.0	98.6	98.3	97.9	98.1	+101.2	99.8	98.7	99.7	97.3	98.7	92.1	98.7	99.5	+101.2	100.9	99.6	97.2	100.5	100.5	100.5
133	"	+102.3	99.6	102.0	102.2	100.2	101.4	97.9	97.3	98.5	97.7	99.4	100.4	98.4	98.1	95.7	100.5	98.8	96.7	100.3	100.6	99.3	98.3	101.4	101.4
121	"	+101.7	101.0	100.1	99.8	99.3	101.0	100.1	99.3	+101.7	100.8	100.2	100.8	98.1	98.1	100.5	98.7	100.5	98.6	99.9	99.1	100.5	100.8	100.4	100.4
120	"	+100.9	97.0	100.3	99.0	100.8	100.7	100.1	100.0	99.9	99.7	99.2	100.5	100.1	100.5	99.7	100.5	98.6	99.9	99.1	100.5	100.5	100.8	100.4	100.4
112	"	100.0	97.8	100.4	100.2	100.2	101.3	99.2	101.8	99.8	100.3	100.6	99.2	99.3	99.6	99.6	100.5	101.7	100.2	101.3	101.0	98.5	101.4	101.0	101.0
113	"	99.6	98.5	98.7	99.2	99.3	100.1	99.3	+101.7	103.2	101.0	101.0	100.0	100.4	99.2	98.2	99.6	98.4	99.0	101.0	100.2	99.7	99.7	101.3	101.3
114	"	97.6	98.9	99.0	100.6	98.4	98.0	97.6	97.9	97.9	100.2	99.7	98.4	99.3	98.4	99.3	99.1	98.5	100.1	97.1	97.4	98.1	100.8	100.7	100.7
115	"	+99.2	100.2	100.4	100.0	99.8	+100.4	99.7	99.9	99.3	101.4	99.6	99.6	99.6	101.0	100.6	99.3	100.2	100.4	100.2	100.2	100.8	100.5	100.3	100.3
116	"	99.7	99.1	98.9	101.4	100.2	99.7	97.0	101.1	100.9	+101.5	98.4	100.1	100.2	99.3	101.0	99.6	99.1	99.6	99.6	97.5	98.0	100.4	98.4	98.4
119	"	100.3	100.2	99.0	99.0	100.0	99.3	99.0	99.1	+100.6	100.8	99.1	98.8	98.6	101.2	99.5	98.7	98.3	99.3	100.0	99.2	101.6	100.7	100.7	100.7
43	2 c.	92.9	100.8	98.9	+101.5	100.9	100.1	99.3	100.4	99.9	100.5	99.9	98.8	99.5	99.7	98.3	+100.6	100.3	99.9	100.5	99.4	98.0	100.2	100.2	100.2
44	"	97.9	97.8	98.9	98.1	98.6	97.5	99.7	100.0	99.9	99.7	97.8	99.2	100.7	98.8	99.1	98.5	99.1	99.0	99.2	99.3	100.1	99.0	99.0	99.0
45	"	97.7	97.4	98.7	98.3	97.9	98.6	99.8	98.1	99.3	+101.3	99.7	98.1	98.1	98.1	99.0	100.7	98.6	100.1	102.0	+102.1	102.1	101.7	101.7	101.7
52	"	98.6	98.8	97.7	98.8	98.8	98.8	99.1	98.6	98.8	99.2	99.3	99.6	99.6	99.6	100.0	100.9	99.1	98.5	100.1	100.5	99.1	99.6	99.6	99.6
53	"	99.0	97.8	99.5	99.0	99.3	98.1	99.9	+100.6	99.5	99.4	97.1	99.4	98.5	98.5	99.2	99.8	99.8	99.8	98.8	100.7	99.9	99.4	99.4	99.4
66	"	97.8	98.1	97.1	99.9	99.4	+100.2	99.9	99.7	99.4	100.0	97.6	97.1	99.9	100.4	97.7	99.5	99.6	99.3	98.1	100.1	98.2	98.1	98.1	98.1
70	"	+97.4	+101.6	100.7	98.4	98.5	99.1	99.2	98.0	99.3	100.2	98.5	101.7	101.9	101.4	98.5	99.2	99.2	99.2	98.6	98.6	98.3	99.5	99.5	99.5
117	1 c.	+101.8	+101.3	100.9	100.4	100.9	100.1	100.4	101.7	99.8	100.5	99.9	99.1	101.4	100.4	101.3	100.7	101.4	100.5	101.3	100.5	100.5	100.2	100.2	100.2
+136	"	+100.0	99.5	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---

\* Injection made 8 p. m. March 31.

† This animal was tested Jan. 14 and 15, 1898.

**Normal temperatures.**

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TABLE XVII.

No. of animal.	Am't in- jected.	Temperatures before injection.										Temperatures after injection.									
		March 31, 1898.										April 1, 1898.									
		7	8	9	10	11	1	2	3	4	5	6	7	8	9	10	11	1	2	3	4
		a. m.	a. m.	a. m.	a. m.	p. m.	p. m.	p. m.	p. m.	a. m.	a. m.	a. m.	a. m.	a. m.	a. m.	a. m.	a. m.	p. m.	p. m.	p. m.	p. m.
*14	2 c. c.	98.8	+100.4	98.5	98.5	95.3	96.3	97.2	98.9	98.9	97.8	98.4	99.1	98.8	98.1	99.1	97.6	98.4	97.0	98.4	98.9
13	"	+102.0	99.2	100.4	99.7	98.0	98.6	99.6	101.6	98.6	98.3	99.2	98.7	99.2	98.8	100.4	97.6	98.6	99.2	99.0	97.3
15	"	100.5	99.9	100.2	+101.5	98.0	99.6	100.2	99.9	100.6	99.8	100.0	99.9	100.7	100.9	+101.0	100.5	100.2	99.8	99.9	100.0
11	"	99.8	99.0	99.7	+100.5	97.0	97.1	99.7	99.2	99.6	99.0	99.1	99.3	99.7	99.4	99.8	98.4	98.1	98.5	98.8	98.2
9	"	99.6	+99.9	98.2	98.0	98.4	98.4	99.1	99.2	99.4	99.6	+100.6	99.0	99.0	100.2	100.5	99.3	99.1	98.1	98.0	98.7
6	"	99.7	100.0	98.9	98.7	97.9	97.8	99.6	99.2	+100.1	99.1	99.8	99.2	98.7	100.6	99.0	99.7	98.8	98.6	99.3	98.3
29	"	100.1	99.8	+100.2	99.2	98.4	97.6	99.4	98.8	99.6	98.3	101.2	97.6	100.1	99.1	97.7	100.1	98.8	98.1	97.3	99.9
57	"	99.8	100.7	100.3	99.4	96.6	99.1	99.3	99.8	100.2	100.2	100.4	98.9	99.4	100.0	100.6	99.3	99.8	98.1	98.8	100.3
56	"	100.7	100.3	100.7	+101.5	100.4	99.3	100.1	100.0	100.2	100.1	100.0	99.7	100.2	100.3	100.5	100.1	98.3	98.0	98.4	98.8
63	"	100.1	100.3	99.6	100.2	98.8	99.6	99.9	99.6	+100.6	98.3	99.7	100.0	100.2	100.0	100.8	99.7	93.0	99.6	99.2	99.6
20	"	99.9	99.0	99.5	+100.2	98.7	97.9	99.0	99.3	98.5	99.2	98.4	99.1	100.3	99.7	100.6	98.4	98.8	101.0	98.8	99.2
17	"	99.3	+100.4	99.9	+100.4	99.0	98.6	99.5	99.0	98.8	98.7	99.4	99.0	100.3	99.7	100.0	99.9	99.5	100.2	99.1	99.1
16	"	100.0	100.0	100.4	98.5	98.0	98.4	100.0	99.8	100.1	99.8	100.0	98.9	99.5	100.0	99.9	99.5	99.0	+100.8	99.9	99.4
2	"	99.2	+98.7	99.8	+99.9	99.0	99.1	99.8	99.6	99.2	99.0	98.5	97.7	99.4	97.9	99.2	99.0	99.2	99.6	+102.0	100.0
23	"	100.3	100.7	100.0	+102.6	98.8	100.0	100.4	102.0	100.9	99.0	+100.2	100.5	100.8	101.5	102.2	102.6	100.9	100.4	100.6	102.4
22	"	+95.6	93.6	99.3	+100.2	97.9	98.2	99.4	99.8	99.0	97.3	98.8	99.2	97.0	100.5	99.6	100.0	99.4	99.5	100.3	99.1
69	"	100.7	+101.6	100.5	100.8	99.6	99.9	100.4	101.2	100.7	100.5	99.2	100.4	101.5	100.6	100.1	100.2	100.0	100.2	100.8	99.5
67	"	100.6	+101.7	99.8	101.4	99.1	98.4	100.1	100.5	99.8	98.2	100.2	98.2	100.2	101.8	101.5	100.4	100.9	99.2	100.2	100.0
59	"	102.3	+102.6	102.0	101.0	99.7	101.4	101.2	100.8	101.3	101.1	101.9	100.8	101.7	101.6	101.0	101.6	100.4	100.7	100.5	99.9
77	"	101.5	101.4	100.8	+102.1	93.5	99.5	99.1	100.1	99.4	100.0	98.8	101.5	100.6	100.9	99.4	100.7	98.0	+101.7	100.4	100.7
82	"	100.8	101.0	100.7	99.4	99.7	99.5	98.4	100.5	100.7	100.7	100.2	100.4	101.4	101.0	101.0	100.7	100.6	99.1	100.2	99.2
78	"	100.8	100.3	101.0	100.4	99.8	101.1	100.2	101.5	100.3	101.0	100.7	100.9	99.4	100.1	101.1	100.3	97.2	100.7	99.1	99.8
74	"	99.6	94.5	100.2	100.0	98.8	101.0	99.6	99.5	100.3	100.3	100.9	99.2	99.2	101.4	99.6	101.4	99.9	100.3	100.6	100.6
79	"	100.3	100.2	99.7	+101.4	98.9	99.6	99.8	100.2	99.4	100.0	99.6	99.0	100.3	99.8	99.9	99.5	98.9	100.3	100.4	100.6
80	"	100.8	+93.6	100.2	+101.0	99.7	99.6	100.9	100.1	100.1	100.1	+100.7	99.6	100.4	99.8	100.2	100.0	100.2	98.1	99.0	99.6
76	"	100.8	100.1	100.3	100.5	99.1	99.8	99.8	100.2	100.9	+101.5	99.3	99.8	100.2	100.1	100.1	99.3	99.5	99.7	99.8	99.6
85	"	99.9	99.3	100.6	99.4	99.0	99.0	99.0	98.6	100.3	100.2	100.2	100.7	100.2	100.1	100.3	102.5	100.7	101.6	99.3	101.2
72	"	99.3	98.8	101.1	100.6	96.8	99.8	+101.3	97.2	99.2	100.2	99.8	100.0	99.6	99.2	100.0	101.3	97.0	100.7	99.7	99.6
75	"	100.6	+101.4	100.9	100.1	97.1	97.8	99.2	99.6	100.1	100.4	100.1	100.4	99.1	99.7	101.3	101.1	99.9	+98.2	99.6	100.0

\* Injection made at 7 p. m. March 31, 1898.

TABLE XVIII.

No. of animal.	Normal temperatures.										Normal temperatures.									
	March 28, 1893.										March 29, 1893.									
	8 a.m.	9 a.m.	10 a.m.	11 a.m.	1 p.m.	2 p.m.	3 p.m.	4 p.m.	5 p.m.	7 a.m.	8 a.m.	9 a.m.	10 a.m.	11 a.m.	1 p.m.	2 p.m.	3 p.m.	4 p.m.	5 p.m.	
105	+ 108.6	99.8	99.4	99.3	100.1	99.7	99.1	100.0	98.3	100.7	100.6	99.2	99.9	+ 101.3	98.2	100.0	98.9	100.5	99.0	
106	99.2	100.2	100.0	+ 100.4	99.1	98.6	+ 98.5	99.6	99.6	+ 101.4	100.0	99.2	100.4	101.0	+ 101.4	+ 101.4	99.7	99.5	98.2	
104	100.3	+ 101.6	99.2	+ 98.0	100.8	98.7	100.3	99.2	100.9	+ 100.3	99.2	100.0	98.6	98.7	99.7	99.1	100.0	99.4	98.7	
105	100.3	100.6	+ 100.7	100.5	100.0	100.3	100.3	100.3	99.8	100.3	+ 101.0	100.4	100.5	100.7	100.4	100.0	100.0	100.6	99.6	
116	+ 100.2	99.6	100.1	+ 99.2	99.2	99.7	99.9	99.4	99.2	100.1	100.2	99.9	100.0	+ 100.5	99.7	99.7	99.6	99.7	99.8	
98	99.9	+ 100.1	99.6	99.4	99.2	99.5	99.6	100.0	99.6	100.5	100.2	100.2	100.6	100.0	99.2	99.8	99.6	100.1	100.0	
96	99.3	99.7	+ 100.2	99.7	100.1	99.8	99.7	99.8	99.4	+ 101.1	100.5	100.8	100.9	100.2	100.0	100.0	99.0	99.0	93.8	
87	100.5	99.8	100.5	99.4	100.2	100.9	100.9	99.9	100.6	100.4	100.2	100.2	101.0	100.8	101.2	100.3	98.2	98.6	97.4	
108	100.6	100.8	+ 101.0	100.2	100.9	100.3	100.7	100.1	100.4	100.7	100.8	98.6	100.5	100.4	100.3	100.4	100.9	101.1	100.7	
107	101.2	102.4	100.9	100.3	99.7	100.6	100.0	100.9	100.4	101.4	100.2	101.1	99.1	100.3	101.0	101.4	100.4	100.5	100.0	
88	101.2	102.0	+ 102.0	101.9	101.9	101.0	101.0	101.0	101.5	101.1	100.1	101.2	101.3	101.0	101.2	101.2	101.3	101.4	101.1	
99	100.3	100.8	100.7	98.9	100.9	100.9	100.5	99.6	99.8	100.7	100.0	100.1	100.7	100.0	101.0	100.0	100.0	99.3	98.2	
97	+ 101.0	100.8	100.7	99.7	99.4	100.3	100.3	99.9	99.9	100.0	100.2	101.0	100.2	100.8	100.1	100.0	99.2	97.9	98.7	
109	100.2	101.4	100.6	100.7	99.8	100.6	100.7	100.1	99.2	100.2	100.0	100.9	99.6	99.8	99.6	100.6	99.9	100.6	100.2	
110	101.0	+ 101.8	101.5	100.9	101.1	100.1	101.1	101.0	100.0	100.2	100.5	100.7	100.3	100.7	100.9	100.4	100.5	100.2	100.4	
111	101.2	+ 101.9	100.5	99.5	100.0	100.1	100.6	98.6	99.7	100.7	101.2	100.8	100.7	100.0	100.7	100.2	99.3	99.9	99.0	
86	100.8	101.8	101.3	100.9	101.0	100.9	101.6	101.7	100.0	100.2	100.4	100.7	100.6	100.1	100.4	100.4	100.4	99.9	98.4	
94	99.9	99.4	99.6	99.6	99.6	99.1	98.9	99.7	100.0	100.2	100.0	100.5	99.9	99.7	100.2	99.7	100.0	99.9	99.9	
18	100.2	101.0	100.1	99.6	+ 101.1	99.7	100.3	99.9	99.3	100.1	99.7	99.7	100.0	99.8	99.5	100.0	99.8	99.7	99.7	
91	+ 101.2	100.4	100.1	100.3	99.4	+ 101.2	100.9	100.0	99.5	100.0	100.0	101.0	101.3	101.1	+ 100.5	+ 101.4	101.0	101.0	99.9	
101	99.3	101.1	100.2	99.3	100.9	100.9	100.0	101.0	101.3	100.5	100.6	100.5	100.5	100.5	100.0	100.6	100.0	99.4	100.2	
90	100.6	100.4	100.4	101.0	100.3	99.8	100.7	100.0	100.8	100.5	100.2	100.9	100.9	100.8	101.0	100.6	101.1	100.7	101.2	
89	100.7	100.6	99.8	100.3	100.2	99.0	99.2	99.9	100.0	100.5	99.7	99.6	100.0	99.7	100.0	99.6	99.7	99.7	99.9	
92	100.1	100.3	+ 100.8	99.7	100.0	99.9	100.3	100.5	99.3	100.0	100.2	100.2	99.1	100.3	99.5	+ 100.5	99.8	99.8	99.9	
93	99.6	99.6	100.0	99.6	100.2	99.8	100.5	100.0	99.7	100.2	100.2	99.8	100.0	99.3	99.8	100.1	99.5	98.0	100.2	
103	100.5	99.2	100.4	99.5	99.9	98.7	98.3	99.0	99.2	99.7	99.5	99.4	100.2	98.9	99.9	99.2	100.0	99.4	99.4	
95	+ 101.2	100.5	100.7	100.2	100.0	100.0	99.9	99.8	100.5	+ 100.6	100.0	100.1	99.6	99.8	99.9	100.1	100.0	99.5	100.0	
96	99.5	100.4	100.7	100.2	100.0	100.0	99.9	100.0	99.5	95.3	99.4	100.3	99.6	99.8	99.9	100.0	100.7	100.4	101.1	

\* Calf dropped during this interval.

TABLE XIX.

No. of animal.	Am't. in-jected.	Temperatures before injection.											Temperatures after injection.										
		March 31, 1898.											April 1, 1898.										
		7	8	9	10	11	1	2	3	4	5	6	7	8	9	10	11	1	2	3	4		
		a. m.	a. m.	a. m.	a. m.	a. m.	p. m.	p. m.	p. m.	p. m.	p. m.	a. m.	a. m.	a. m.	a. m.	a. m.	a. m.	p. m.	p. m.	p. m.	p. m.		
*105.	2 c. c.	100.1	98.9	+101.1	99.4	98.0	96.2	96.3	98.3	97.4	97.7	98.0	98.0	98.6	98.4	100.1	98.8	98.6	97.9	93.3	99.0		
100.		+99.3	100.1	+100.4	99.2	99.7	97.1	96.6	98.4	97.1	97.1	98.0	98.9	98.9	98.4	98.4	100.0	98.0	97.7	97.2	+101.0		
104.		+101.2	99.4	100.6	98.9	100.0	98.3	97.8	98.3	97.8	97.8	98.0	98.3	98.3	97.8	97.8	+100.8	97.9	98.9	98.8	98.7		
105.		+101.2	100.4	101.0	101.0	100.6	98.3	97.8	98.3	97.8	97.8	98.0	98.3	98.3	97.8	97.8	+101.0	98.8	98.8	98.8	98.8		
116.		+100.4	100.4	+100.5	100.1	100.4	99.6	99.4	99.6	99.4	99.4	99.4	99.4	99.4	99.4	99.4	99.4	99.4	99.4	99.4	100.0		
98.		+101.0	100.0	100.4	100.4	100.4	99.7	99.7	100.2	99.7	99.7	99.7	99.7	99.7	99.7	99.7	99.7	99.7	99.7	99.7	99.6		
96.		+100.6	100.4	+100.6	100.6	100.6	99.7	99.7	100.2	99.7	99.7	99.7	99.7	99.7	99.7	99.7	99.7	99.7	99.7	99.7	99.6		
87.		+101.6	100.2	101.0	100.7	100.3	98.4	97.9	99.0	98.2	98.2	98.2	98.2	98.2	98.2	98.2	100.8	98.2	98.2	98.2	98.2		
101.		+101.3	101.0	100.6	100.7	101.0	100.3	99.7	99.9	99.2	98.4	98.3	98.3	98.3	98.3	98.3	100.2	98.3	98.3	98.3	98.3		
107.		+101.2	101.4	101.0	101.2	100.9	98.0	98.3	100.1	98.0	98.0	101.1	101.4	101.4	101.4	101.4	99.8	100.5	99.8	100.2	100.2		
88.		101.4	101.4	+101.6	101.3	+101.6	101.4	101.3	100.8	100.8	101.3	101.5	100.9	101.2	101.2	101.2	101.7	101.3	100.0	100.0	100.8		
99.		+100.2	+100.5	99.4	100.1	99.9	99.3	98.4	97.9	99.0	98.2	98.2	98.2	98.2	98.2	98.2	100.8	98.2	98.2	98.2	98.2		
97.		+100.8	+101.2	100.5	99.9	100.3	100.3	100.1	97.3	97.1	97.1	97.5	97.1	98.9	98.7	98.9	99.9	100.4	99.9	99.9	99.4		
109.		+100.6	+101.2	100.8	100.4	99.9	99.9	99.9	99.2	98.4	98.3	98.3	98.3	98.3	98.3	98.3	98.3	98.3	98.3	98.3	98.3		
110.		+101.4	+101.6	101.1	101.0	+99.1	100.7	100.3	100.0	99.6	99.4	100.0	99.6	100.4	+100.0	100.4	101.0	+101.6	100.9	100.9	100.7		
111.		101.0	+101.2	101.1	100.7	100.0	98.9	100.0	100.0	98.1	97.4	100.0	98.1	100.8	+99.7	100.5	102.1	102.8	104.7	+104.8	104.5		
86.		+100.6	100.9	100.3	100.6	101.1	100.3	100.0	100.2	98.4	99.6	100.2	98.4	99.5	99.6	99.5	99.7	101.4	101.4	101.3	102.3		
94.		+100.7	100.2	100.4	+101.9	100.8	100.4	100.2	99.8	98.6	99.8	99.8	98.6	99.4	99.8	99.2	100.1	99.9	100.0	100.8	99.4		
18.		+99.1	+100.6	100.0	100.1	99.6	100.1	99.6	100.4	99.6	100.4	99.6	100.4	99.1	99.2	98.5	100.1	99.9	100.6	99.9	99.1		
91.		+100.4	101.0	100.5	99.5	100.8	98.0	100.4	99.8	+101.1	99.5	99.5	98.0	99.5	98.0	99.0	99.8	99.5	100.1	+100.6	100.3		
101.		+100.4	100.3	100.0	100.3	100.0	99.4	100.0	100.3	98.7	96.7	99.9	100.2	100.9	100.0	100.0	101.0	101.1	100.6	101.5	100.6		
90.		+101.1	101.2	101.0	99.5	100.4	100.9	98.3	101.0	101.0	101.0	100.7	100.3	100.2	101.4	100.4	100.6	100.0	100.8	100.6	101.2		
89.		+99.2	100.0	+100.2	99.7	99.7	100.0	99.7	99.7	99.7	97.8	99.3	99.3	98.5	+100.4	99.2	99.7	99.7	99.0	99.5	98.7		
92.		+100.8	100.0	100.0	99.7	100.0	99.4	99.5	99.9	99.4	97.8	99.4	99.4	99.4	99.4	99.4	99.4	99.4	99.4	99.4	99.4		
93.		99.9	92.7	99.9	+100.0	99.4	99.7	99.0	99.8	99.4	99.4	99.1	99.2	99.0	100.0	99.9	100.0	99.9	100.0	99.7	99.4		
103.		+100.2	100.2	99.8	100.2	100.6	99.6	99.2	100.2	99.7	99.7	98.5	99.2	97.2	99.8	+100.2	99.8	99.8	99.8	99.4	99.4		
95.		+101.3	99.7	100.9	100.2	100.6	99.7	99.7	99.8	100.1	99.6	98.1	98.9	98.9	99.8	99.8	99.8	99.8	99.8	99.2	99.2		
39.		99.0	99.0	99.0	99.0	99.1	99.0	98.3	99.9	98.3	99.0	98.9	98.2	99.0	99.0	99.0	99.0	99.0	99.0	99.1	99.1		



TABLE XX.

No. of animal.	Normal temperatures.										
	March 28, 1898.										
	8	9	10	11	1	2	3	4	5	7	8
+ 10	98.2	98.2	98.2	98.8	98.6	97.7	98.8	99.4	98.0	98.3	98.0
+ 7	98.2	97.8	99.4	98.4	98.8	98.3	98.3	99.7	98.2	100.1	98.6
+ 21	98.1	98.9	98.4	98.8	98.8	98.8	98.6	99.4	98.6	98.3	98.8
+ 24	98.7	98.8	99.9	99.2	99.5	99.5	98.2	98.3	98.6	99.6	98.6
+ 4	97.7	98.2	99.8	99.9	99.8	99.2	100.8	99.7	99.1	101.8	99.2
+ 49	98.1	99.1	97.2	100.0	98.1	98.5	100.8	99.6	98.1	100.4	99.4
+ 30	98.5	98.5	98.6	98.7	97.8	99.4	98.8	98.8	98.8	100.5	100.6
+ 32	98.7	97.8	98.3	98.2	97.8	98.7	98.6	98.6	98.1	98.8	98.8
+ 5	98.8	98.3	98.8	99.7	97.5	97.9	99.8	98.0	98.0	99.4	98.8
+ 28	98.9	97.8	98.6	98.0	98.8	99.8	98.1	100.1	99.5	98.1	98.7
+ 131	98.6	98.9	98.2	100.1	100.3	98.5	101.6	98.5	100.7	98.8	98.8
+ 135	101.7	100.2	97.4	101.5	101.4	101.7	101.6	101.7	102.2	100.2	100.6
+ 37	99.7	99.8	97.5	99.4	98.7	98.8	99.4	98.5	99.1	98.1	97.5

Normal temperatures.

March 29, 1898.

	8	9	10	11	1	2	3	4	5	7	8	9	10	11	1	2	3	4	5
	a. m.	a. m.	a. m.	a. m.	p. m.	p. m.	p. m.	p. m.	p. m.	a. m.	a. m.	a. m.	a. m.	a. m.	p. m.	p. m.	p. m.	p. m.	p. m.
10	98.2	98.2	98.2	98.8	98.8	97.7	98.8	98.8	98.0	98.3	98.0	98.1	97.7	97.0	98.9	98.2	98.5	98.9	99.1
7	98.2	97.8	98.4	98.4	98.8	98.3	98.3	98.3	98.6	100.1	98.5	100.6	98.2	97.7	98.9	98.6	98.7	98.9	99.3
21	98.1	98.9	98.4	100.0	98.8	98.6	98.6	98.6	98.6	98.3	98.8	98.4	98.2	98.2	98.5	98.9	98.2	98.9	99.3
4	98.7	98.8	98.9	98.2	98.5	98.2	98.2	98.3	98.3	100.4	98.5	98.5	98.3	98.3	98.1	98.9	98.1	97.4	98.9
	+	98.2	98.8	98.9	98.8	98.2	98.2	98.3	98.3	+	98.2	100.5	98.9	98.9	98.6	100.6	98.7	100.9	100.9
49	98.1	98.1	98.2	100.0	98.8	98.5	100.8	98.6	98.1	100.4	98.4	98.1	98.8	98.8	98.3	98.7	97.8	100.2	100.3
30	98.5	98.5	98.6	98.7	98.7	98.4	98.8	98.8	98.1	100.6	100.6	98.1	98.8	98.8	98.0	98.2	98.5	98.5	98.8
32	98.7	98.7	98.8	98.2	98.2	98.7	98.9	98.6	98.7	98.4	100.2	97.2	+	98.9	98.9	98.9	98.9	100.7	+
5	98.8	98.3	98.8	98.7	97.5	97.9	98.8	98.0	98.3	98.8	98.8	98.0	100.6	98.3	97.4	98.4	98.3	98.6	98.0
26	98.9	97.8	98.6	98.0	98.8	98.8	98.1	100.1	98.5	98.1	98.7	97.7	98.4	97.6	98.8	98.3	98.3	98.6	98.1
31	98.6	98.9	98.2	100.1	100.3	98.5	101.6	98.5	98.5	98.0	98.0	100.4	98.0	98.6	98.9	98.9	98.3	98.3	98.2
35	101.7	100.2	97.4	101.5	101.4	101.7	101.8	101.7	102.2	100.2	100.6	101.4	100.4	98.6	98.9	100.7	100.7	100.5	101.2
37	98.7	98.3	98.4	98.4	98.7	98.8	98.4	98.5	98.5	98.1	97.5	98.5	98.7	98.8	98.8	98.3	98.3	98.5	98.6

TABLE XXI.

No. of animal.	Am't in-jected.	Temperatures before injection.										Temperatures after injection.													
		March 31, 1898.										April 1, 1898.													
		7 a. m.	8 a. m.	9 a. m.	10 a. m.	11 a. m.	1 p. m.	2 p. m.	3 p. m.	4 p. m.	5 p. m.	6 a. m.	7 a. m.	8 a. m.	9 a. m.	10 a. m.	11 a. m.	1 p. m.	2 p. m.	3 p. m.	4 p. m.	5 p. m.			
10	2 c. c.	99.7	99.3	97.7	97.1	97.2	98.4	97.9	99.0	98.6	98.4	97.7	98.3	99.2	98.8	98.8	99.2	98.9	98.3	98.7	98.4	97.8	98.3	98.0	
7	"	99.7	98.9	97.5	96.7	97.3	98.5	99.7	99.7	100.4	100.0	100.6	98.6	98.1	98.3	98.0	100.1	98.3	96.7	97.5	97.3	98.2	99.2	98.3	98.1
21	"	99.8	99.9	99.2	98.4	98.6	100.2	99.1	98.8	99.4	99.6	97.4	99.4	98.8	100.0	99.2	98.8	98.6	98.7	100.0	98.2	98.3	98.3	98.3	
24	"	99.7	100.6	98.5	98.3	98.7	99.4	98.7	99.6	98.4	99.4	99.1	99.1	100.2	98.6	99.8	100.2	99.1	99.4	100.3	99.0	99.9	100.0	100.1	
4	"	99.9	100.3	99.5	97.3	98.2	101.9	102.4	100.6	101.3	103.9	101.9	99.9	100.4	98.6	98.7	99.6	98.2	98.4	98.4	98.4	99.3	98.9	101.5	
49	"	99.9	100.3	97.8	98.2	98.6	100.4	99.6	101.3	99.7	99.7	99.7	98.8	99.3	99.3	100.3	99.5	99.3	98.8	103.3	102.8	102.7	102.8	101.6	
30	"	98.7	99.7	98.7	99.9	98.5	99.5	99.1	99.9	99.1	99.3	100.1	98.3	98.9	98.8	98.7	98.9	98.9	100.2	101.2	101.6	100.8	101.2	102.6	
32	"	100.0	98.6	98.1	97.0	98.6	96.9	98.6	96.9	96.9	100.6	100.6	100.9	102.3	101.4	101.4	101.4	101.6	103.5	101.9	101.4	99.1	98.6	98.9	
5	"	98.6	99.2	99.4	97.8	97.6	97.2	100.8	99.3	97.9	97.9	100.4	97.7	98.9	99.6	99.6	99.3	98.5	97.7	101.2	99.6	101.9	101.7	101.3	
26	"	98.6	99.1	98.8	97.8	98.5	99.8	98.6	97.4	98.4	98.9	97.6	98.6	99.2	99.5	99.5	99.5	98.8	99.7	101.8	102.1	103.0	101.0	102.1	
134	1 c. c.	100.1	102.1	98.1	101.0	98.6	97.9	98.0	100.7	101.6	99.9	98.9	98.9	98.5	98.2	100.4	98.6	101.3	98.8	98.5	98.1	99.5	98.2	100.2	
135	"	99.8	100.9	99.9	100.8	100.9	101.4	101.8	102.4	102.0	102.1	99.1	98.9	100.1	100.9	100.8	100.1	99.7	100.8	100.7	101.4	100.5	100.2	100.9	
37	2 c. c.	98.2	98.8	98.8	99.5	98.0	100.0	98.8	97.8	97.8	99.2	98.9	98.4	98.6	98.6	98.7	100.9	100.6	101.6	102.4	102.1	101.8	101.2	101.8	

\* Injection made at 8 p. m. March 31, 1898.

## STUDY OF NORMAL MAXIMAL TEMPERATURES.

The term normal in this connection refers to those temperatures taken previous to the injection of tuberculin and those which are so designated in the tables. Every condition was observed to maintain the usual environments and circumstances to which the cattle were accustomed every day prior to the taking of temperatures. So far as it was possible every feature was removed which would preclude errors in the obtaining of normal records upon which we could base our reasons for condemnation:

In a study of the normal maximal temperature, which is so frequently the guide in the condemnation of animals, it is our purpose to show primarily the extent of variation which may take place even when the highest limit of temperature is taken only. The table that follows will fairly illustrate this point because it is a simple record of the normal maximal temperatures and the time when they occurred.



*Study of Normal Maximal Temperatures.*

No. of animal.	March 31, 1896.	May 11, 1896.	August 20, 1896.	August 26, 1896.	April 20, 1897.	April 22, 1897.	October 12, 1897.	October 13, 1897.	March 23, 1898.	March 29, 1898.	March 31, 1898.	Lowest maximal temperature.	Highest maximal temperature.	Degrees of variation.
1.	101.0													
2.	100.8	101.7			101.2		102.4	102.2	100.8	100.7	99.9	99.9	102.4	2.5
3.	102.3													
4.	101.5				101.5			101.9	100.3	101.3	103.9	100.3	103.9	3.6
5.	102.3				102.0		101.8	101.3	99.8	100.6	100.8	99.8	103.3	2.5
6.	102.2													
7.	101.7				101.4				100.7	100.1	100.1	99.7	106.4	5.3
8.	101.6				101.1		101.3	101.6	99.7	100.6	100.6	99.7	101.7	2.0
9.	101.2													
10.	101.2			102.1	101.2	101.5	101.4	101.4	100.7	100.2	99.9	99.9	101.4	1.5
11.	102.8								99.4	99.9	99.7	99.4	102.2	2.5
12.	102.3				101.6				100.9	101.3	100.5	100.5	102.8	2.3
13.	102.2				102.0							102.0	102.3	3
14.	102.5				101.5		101.2	101.1	100.7	102.0	102.0	100.7	104.2	1.5
15.	102.1	101.8	101.5		101.4		102.2	101.7	100.2	100.0	100.4	100.0	102.5	2.5
16.	102.6				102.4				101.2	102.0	101.5	101.2	102.4	1.2
17.	101.4	103.2			101.2		101.6	101.5	101.3	99.6	100.4	99.6	103.2	3.6
18.	101.8	101.4			101.4		100.8	100.8	100.6	104.2	100.4	100.4	104.2	3.8
19.	101.6				101.5							101.5	101.8	3
20.	102.6	102.1										101.6	102.1	5
21.	101.3				101.8				102.3	100.5	100.2	100.2	102.6	2.4
22.	101.2	102.0												
23.	103.6			102.1	101.5	101.8		103.3	100.0	99.4	100.2	99.4	103.3	3.9
24.	101.2							101.6	100.9	100.2	100.2	100.2	102.1	1.9
25.	103.0			103.0	101.0	101.7	101.1	101.3	102.0	101.9	102.6	101.0	103.6	2.6
26.	102.0	102.8						102.8	99.9	100.4	100.6	99.9	103.0	3.1
27.	102.9											102.8	103.0	2
28.	101.7		104.0											
29.	101.8				101.6									
30.	102.0	101.8	101.6		101.2			100.7	100.1	98.8	99.8	98.8	102.0	3.2
31.	102.0			102.1	101.4							101.4	102.9	1.5
32.	102.0				101.3							101.3	104.0	2.7
33.	102.0			102.4	101.2							100.2	101.8	1.6
34.	102.0	102.4	101.6					102.2	99.8	100.6	100.2	99.8	102.2	2.4
35.	101.8													
36.	102.3													
37.	101.4	102.2	101.9		101.5			102.0	99.8	99.6	100.5	99.6	102.2	2.6
38.	102.0	101.5	101.6			101.2						101.2	102.0	3
39.	102.2	101.2			101.6				103.0	101.1	99.9	99.9	103.0	3.1
40.	102.4													
41.	100.8			101.6	101.4							100.8	101.6	3
42.	101.9			102.2	102.6			101.9				101.9	102.6	7
43.	102.0				101.4							99.8	102.0	2.2
44.	101.4				100.8		101.3	100.3	99.8	99.9	101.5	99.8	101.4	1.9
45.	101.6	102.0	100.4		102.2				98.5	99.7	100.0	99.5	102.2	3.4
46.	102.4								98.8	99.2	101.3	98.8	102.4	1.1
47.	102.0	103.4			101.3							101.3	102.4	1.4
48.	102.1											102.0	103.4	1.4
49.	102.6			102.2	102.4			102.6	100.8	100.4	101.3	100.4	102.6	2.2
50.	101.3	102.9	101.2									101.2	102.9	1.7
51.	101.8	103.9	101.7									101.7	103.9	2.2
52.	101.5				101.6		102.3	101.6	98.9	101.0	99.9	98.9	102.3	3.4
53.	102.9				101.9		101.5	101.7	102.0	103.6	100.6	100.6	103.6	3.0
54.	103.5	102.7		102.7								102.7	103.5	3
55.	102.3													
56.	101.3	102.1	102.4		102.3				101.5	100.5	101.5	100.5	102.4	1.9
57.	101.9				102.0				102.3	101.7	100.7	100.7	102.3	1.6
58.			102.8											

*Study of Normal Maximal Temperatures.—Continued.*

No. of animal.	March 31, 1896.	May 11, 1896.	August 20, 1896.	August 28, 1896.	April 20, 1897.	April 22, 1897.	October 12, 1897.	October 13, 1897.	March 28, 1898.	March 29, 1898.	March 31, 1898.	Lowest maximal temperature.	Highest maximal temperature.	Degrees of variation.
59			108.0		101.6		101.7	101.5	102.5	102.8	102.6	101.5	108.0	1.5
60		104.9												
61			105.0											
62			108.1											
63		102.0	102.5		102.3				100.7	101.0	100.6	100.6	102.5	1.9
64		102.5	102.3		102.2							102.3	103.2	1.0
65		102.5	101.9	101.8	102.5							101.3	102.5	.7
66		102.9	108.1	103.4								102.9	103.4	.5
67				103.0	108.6				102.0	102.8	101.7	101.7	108.6	1.9
68				102.6	101.4				100.2	98.7	100.2	98.7	102.6	2.9
69				103.0	103.1				102.0	103.9	101.6	101.6	103.9	2.3

No. of animal.	April 20, 1897.	April 22, 1897.	October 12, 1897.	October 13, 1897.	March 28, 1898.	March 29, 1898.	March 31, 1898.	Lowest maximal temperature.	Highest maximal temperature.	Degrees of variation.
70	102.3				100.2	99.6	101.6	99.6	102.3	2.7
71	101.4									
72	102.7									
73	101.9				102.6	101.0	101.3	101.6	102.0	1.0
74	102.0				101.2	102.1	101.0	101.0	102.1	1.1
75	101.4				101.9	100.9	101.4	100.7	101.9	1.2
76	102.1		101.3	100.7	102.1	102.2	101.5	101.5	102.2	.7
77	103.2				101.7	101.8	102.1	101.7	103.2	1.5
78	102.4				101.4	101.4	101.5	101.4	102.4	1.0
79	103.1				101.5	100.3	101.4	100.3	103.1	2.8
80	102.8				101.5	101.7	101.0	101.0	102.8	1.8
81	102.0									
82	108.1				100.6	100.9	101.0	100.6	103.1	2.5
83		102.4		102.2				102.2	102.4	.2
84	102.2									
85	101.9				101.6	97.3	101.0	97.3	101.9	4.6

No. of animal.	September 3, 1897.	September 4, 1897.	September 6, 1897.	October 13, 1897.	March 28, 1898.	March 29, 1898.	March 31, 1898.	Lowest maximal temperature.	Highest maximal temperature.	Degrees of variation.
86	103.0	102.6	102.0		101.8	100.7	101.1	100.7	103.0	2.3
87	102.6	101.8	102.5		100.9	101.2	101.6	100.9	102.6	1.7
88	101.9	101.7	102.3		102.0	101.4	101.6	101.4	102.3	.9
89	102.3	101.8	102.4		101.0	100.5	100.2	100.2	102.4	2.2
90	101.1	100.9	102.2		101.0	101.2	101.3	100.9	102.2	1.3
91	102.6	102.2	102.4		101.2	101.4	101.1	101.1	102.6	1.5
92	101.9	101.8	102.1		100.8	100.5	100.8	100.5	102.1	1.6

*Study of Normal Maximal Temperatures.—Concluded.*

No. of animal.	September 3, 1897.	September 4, 1897.	September 6, 1897.	October 12, 1897.	October 13, 1897.	March 28, 1898.	March 29, 1898.	March 31, 1898.	Lowest maximal temperature.	Highest maximal temperature.	Degree of variation.
93.....	102.3	101.5	102.1	-----	-----	100.5	100.2	100.0	100.0	102.3	2.3
94.....	102.5	103.3	102.6	-----	-----	100.2	100.5	101.9	100.2	103.3	3.1
95.....	102.0	101.9	102.4	-----	-----	101.2	100.6	101.3	100.6	102.4	1.8
96.....	102.2	102.9	102.2	-----	-----	100.2	101.1	100.6	100.2	102.9	2.7
97.....	103.8	103.6	103.4	-----	-----	101.0	101.0	101.3	101.0	103.8	2.8
98.....	102.1	102.1	102.4	-----	-----	100.1	100.6	101.0	100.1	102.4	2.3
99.....	102.8	102.0	102.7	-----	-----	100.9	101.0	100.5	100.5	102.8	2.3
100.....	102.4	102.3	102.4	-----	-----	100.4	101.4	100.4	100.4	102.4	2.0
101.....	-----	-----	-----	101.1	100.9	101.3	100.6	100.4	100.4	101.3	.9
102.....	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----
103.....	-----	-----	-----	101.7	101.4	100.5	100.2	100.7	100.2	101.7	1.5
104.....	-----	-----	-----	101.4	101.3	101.6	100.3	101.2	100.3	101.6	1.3
105.....	-----	-----	-----	101.3	101.2	103.6	101.3	101.1	101.1	103.6	2.5
106.....	-----	-----	-----	101.8	102.4	100.7	101.0	101.2	100.7	102.4	1.7
107.....	-----	-----	-----	101.4	101.0	102.4	101.4	101.5	101.0	102.4	1.4
108.....	-----	-----	-----	101.1	101.4	101.0	101.1	101.3	101.0	101.4	.4
109.....	-----	-----	-----	101.0	101.3	101.4	100.6	101.2	100.6	101.4	.8
110.....	-----	-----	-----	102.4	101.7	101.8	100.9	101.6	100.9	102.4	1.5
111.....	-----	-----	-----	101.5	102.3	101.9	101.2	101.2	101.2	102.3	1.1
112.....	-----	-----	-----	102.3	101.8	99.9	101.0	101.8	99.9	102.3	2.4
113.....	-----	-----	-----	102.8	102.9	101.8	101.6	101.7	101.6	102.9	1.3
114.....	-----	-----	-----	103.0	101.9	102.2	100.5	100.6	100.5	103.0	2.5
115.....	-----	-----	-----	103.3	102.6	101.8	100.7	100.4	100.4	103.3	2.9
116.....	-----	-----	-----	-----	-----	100.2	100.5	100.5	100.2	100.5	.3
117.....	-----	-----	-----	-----	-----	100.6	103.1	101.8	100.6	103.1	2.5
118.....	-----	-----	-----	-----	-----	102.2	100.8	101.5	100.8	102.2	1.4
119.....	-----	-----	-----	-----	-----	100.1	100.7	101.6	100.1	101.6	1.5
120.....	-----	-----	-----	-----	-----	101.5	101.8	100.9	100.9	101.8	.9
121.....	-----	-----	-----	-----	-----	101.2	101.4	101.7	101.2	101.7	.5
122.....	-----	-----	-----	-----	-----	102.2	101.1	101.2	101.1	102.2	1.1
123.....	-----	-----	-----	-----	-----	101.3	101.4	101.7	101.4	101.8	.4
124.....	-----	-----	-----	-----	-----	103.8	101.7	100.7	100.7	103.8	3.1
125.....	-----	-----	-----	-----	-----	101.1	103.1	101.2	101.1	103.1	2.0
126.....	-----	-----	-----	-----	-----	100.3	101.1	101.3	100.3	101.3	1.0
127.....	-----	-----	-----	-----	-----	102.3	99.9	101.9	99.9	102.3	2.4
128.....	-----	-----	-----	-----	-----	102.0	101.0	102.3	101.0	102.3	1.3
129.....	-----	-----	-----	-----	-----	101.6	101.8	102.1	101.6	102.1	.5
130.....	-----	-----	-----	-----	-----	101.5	102.5	102.6	101.5	102.6	1.1
131.....	-----	-----	-----	-----	-----	102.3	102.6	102.2	102.2	102.6	.4
132.....	-----	-----	-----	-----	-----	103.1	103.1	102.2	102.2	103.1	.9
133.....	-----	-----	-----	-----	-----	101.6	101.6	102.3	101.6	102.3	.7
134.....	-----	-----	-----	-----	-----	100.7	100.4	101.6	100.4	101.6	1.2
135.....	-----	-----	-----	-----	-----	102.2	101.4	102.4	101.4	102.4	1.0
136.....	-----	-----	-----	-----	-----	-----	-----	100.0	-----	-----	-----

From the above table, the normal maximal temperatures, it will be noted, range in variation from a fraction of a degree to over five degrees. These temperatures, it is true, cover a period of two years; yet some of the greatest variations are found occurring during two successive days. This may be noted in the cases of Nos. 5 and 17 and in a less marked degree in Nos. 20, 39, 53, 69, 105, 114 and others. Owing to this great variation in normal maximal temperatures we feel justified in bidding caution to all operators in the tuberculin test. The too prevalent method of finding the maximal temperatures of the day of and the day after injection and condemning animals in accordance with this standard without any further investigation may be the means of unnecessary destruc-

tion of property. There are cases where this would be legitimately allowable as we shall see later in a survey of reactions, but when it is applied irrespective of other features it cannot be justified. Where there is a possibility of five degrees of variation in normal maximal temperatures, two degrees cannot be taken as the sole criterion for placing the stamp of "tuberculous" upon an animal.

It does seem incredible to learn from various sources that skilled men have tested thousands of cattle with only two or three errors per thousand and those errors on the side of obtaining no reaction in tuberculous cattle, when normal temperatures of ninety-eight cattle belonging to the M. A. C. herd, this spring, would have practically condemned four. If the variation is taken as two degrees irrespective of days, nine would have been condemned. (See above tables for March 28 and 29, 1898). These temperatures were taken in exactly the same way as we would take them in a regular test, omitting two or three hours in the early morning. None of these variations occurred in the eleven cattle which had already been condemned at a previous test. This certainly indicates that we must proceed with much circumspection, otherwise, tuberculin will be thrown into disrepute, notwithstanding the hyper-enthusiastic spirit which is exercised in its behalf. Let us hold to its real value.

#### SUDDEN CHANGES IN TEMPERATURE.

We frequently find the maximal and minimal temperatures for the day occurring within one hour of each other. This is of interest not only from the suddenness of the change, but its bearing upon the interpretations made. It is maintained by some operators that this suddenness of change is due to the thermometer. Perhaps in some cases this is true, for where a thermometer is encased, the case may become cold, so that, upon insertion, the temperature would not be recorded accurately in three minutes time. I have met with this very trouble in the course of my work; but when the taking of the temperature is repeated with the greatest care and the temperature shows a sudden change, some other agency must be at work.

We wish to give some of these sudden changes as we find them scattered through the tables.

Table.	No. of animal.	Time.	Temperature.	Time.	Temperature.	Date.
*I-----	11	2 p. m.	102.8	6 p. m.	101.9	March 31, 1898.
	12	8 a. m.	100.6	10 a. m.	102.3	" 31, 1898.
	16	2 p. m.	102.6	6 p. m.	101.8	" 31, 1898.
	17	2 p. m.	101.4	6 p. m.	100.4	" 31, 1898.
	18	12 m.	101.8	2 p. m.	98.8	" 31, 1898.
	19	12 m.	100.4	2 p. m.	101.6	" 31, 1898.
	20	2 p. m.	102.6	6 p. m.	101.0	" 31, 1898.
	28	8 a. m.	101.7	10 a. m.	101.0	" 31, 1898.
	86	8 a. m.	101.6	9 a. m.	103.0	September 3, 1897.
	88	7 a. m.	101.7	8 a. m.	101.0	" 4, 1897.
IX-----	92	3 p. m.	100.4	4 p. m.	101.8	" 4, 1897.
	93	10 a. m.	102.3	11 a. m.	100.7	" 3, 1897.
	95	11 a. m.	101.9	1 p. m.	100.8	" 4, 1897.
	96	9 a. m.	102.2	10 a. m.	100.8	" 3, 1897.
	98	11 a. m.	102.1	1 p. m.	100.8	" 3, 1897.
	99	10 a. m.	100.6	11 a. m.	102.8	" 3, 1897.
	99	11 a. m.	102.0	1 p. m.	101.2	" 4, 1897.
	100	8 a. m.	102.4	9 a. m.	101.3	" 3, 1897.
	14	8 a. m.	102.2	9 a. m.	101.2	October 12, 1897.
	109	2 p. m.	100.0	3 p. m.	101.3	" 13, 1897.
XI-----	111	11 a. m.	100.4	1 p. m.	101.5	" 12, 1897.
	110	3 p. m.	100.9	4 p. m.	102.4	" 12, 1897.
	110	11 a. m.	100.6	1 p. m.	101.7	" 13, 1897.
	107	4 p. m.	100.3	5 p. m.	101.4	" 12, 1897.
	101	8 a. m.	101.1	9 a. m.	99.5	" 12, 1897.
	106	11 a. m.	100.7	1 p. m.	101.8	" 12, 1897.
	106	8 a. m.	101.2	9 a. m.	100.1	" 13, 1897.
	130	9 a. m.	102.5	10 a. m.	99.2	March 29, 1898.
	132	1 p. m.	99.8	2 p. m.	103.1	" 28, 1898.
	44	8 a. m.	97.3	9 a. m.	99.7	" 28, 1898.
XIV-----	43	10 a. m.	96.4	11 a. m.	99.8	" 28, 1898.
	126	9 a. m.	100.3	10 a. m.	98.1	" 28, 1898.
	126	4 p. m.	97.9	5 p. m.	101.1	" 29, 1898.
	122	7 a. m.	96.4	8 a. m.	101.1	" 29, 1898.
	52	9 a. m.	97.3	10 a. m.	101.0	" 29, 1898.
	121	11 a. m.	101.4	1 p. m.	99.0	" 29, 1898.
	53	4 p. m.	102.0	5 p. m.	99.3	" 28, 1898.
	53	7 a. m.	99.8	8 a. m.	103.6	" 29, 1898.
	112	9 a. m.	99.9	10 a. m.	97.2	" 28, 1898.
	113	11 a. m.	96.4	1 p. m.	101.8	" 28, 1898.
XV-----	120	4 p. m.	101.5	5 p. m.	99.4	" 28, 1898.
	117	11 a. m.	100.6	1 p. m.	98.8	" 28, 1898.
	117	7 a. m.	99.1	8 a. m.	103.1	" 29, 1898.
	13	9 a. m.	100.7	10 a. m.	99.0	" 28, 1898.
	15	10 a. m.	99.2	11 a. m.	101.2	" 28, 1898.
	20	1 p. m.	98.7	2 p. m.	100.5	" 29, 1898.
	16	7 a. m.	99.6	8 a. m.	98.3	" 29, 1898.
	23	9 a. m.	101.9	10 a. m.	99.2	" 29, 1898.
	22	3 p. m.	98.6	4 p. m.	100.9	" 28, 1898.
	22	9 a. m.	98.6	10 a. m.	100.2	" 29, 1898.
XVIII-----	59	10 a. m.	102.8	11 a. m.	100.5	" 29, 1898.
	82	10 a. m.	100.9	11 a. m.	99.3	" 29, 1898.
	85	8 a. m.	101.6	9 a. m.	99.2	" 28, 1898.
	72	7 a. m.	96.9	8 a. m.	101.0	" 29, 1898.
	75	10 a. m.	100.9	11 a. m.	99.0	" 29, 1898.
	105	11 a. m.	101.3	1 p. m.	98.2	" 29, 1898.
	99	1 p. m.	98.9	2 p. m.	100.9	" 28, 1898.
	91	1 p. m.	99.4	2 p. m.	101.2	" 28, 1898.
	89	2 p. m.	101.0	3 p. m.	99.2	" 28, 1898.
	93	4 p. m.	98.0	5 p. m.	100.2	" 29, 1898.
XX-----	103	10 a. m.	100.2	11 a. m.	98.9	" 29, 1898.
	7	4 p. m.	99.7	5 p. m.	97.3	" 28, 1898.
	21	10 a. m.	98.4	11 a. m.	100.0	" 28, 1898.
	24	2 p. m.	99.9	3 p. m.	98.2	" 28, 1898.
	26	11 a. m.	97.6	1 p. m.	98.8	" 29, 1898.
	37	9 a. m.	99.8	10 a. m.	97.5	" 29, 1898.

\* Table I is the result of test applied by Prof. E. A. A. Grange.

The above table adds materially to the evidence of great variation and also demonstrates that this variation may be very sudden. Here we are inclined to criticise operators who have made a practice of taking only one or two temperatures. These sudden and decided changes cannot be taken into account when only a single temperature is considered, and it is difficult to understand how a good judgment may be formed from so limited data. The greater the number of normal temperatures we have of an animal the better may we be able to discover any influence of tuberculin. Of course, there is a limit to practicability. The expense of a test must be taken into account, accordingly the number of normal temperatures must be confined to a definite period. The rule should be made, take as many normal temperatures as it is feasible to take. Keep all the records and compare them each time. It may be that the different seasons of the year exert an influence or that a cold day or warm day has its power in producing a change. For these reasons we shall make a comparative study of seasons as to their effect in modifying temperature in animals.

**INFLUENCE OF SEASONS OR ATMOSPHERIC TEMPERATURE UPON TEMPERATURE OF ANIMALS.**

All the material in the tables will not be used to demonstrate this point, but will confine my attention to Table IX of normal temperatures taken September 3d and 4th, 1897, during very warm weather, and the normal temperatures of the same animals taken March 28th and 29th, 1898, when the air was quite cool but not cold. While the following table does not comprise all the data, it will give sufficient to establish this point, whether atmospheric temperature has any influence or not upon animal heat. A further study of other tables conveys the same testimony, but too much space would be required to bring all the facts together at this place. We shall, therefore, content ourselves with a single table.

No. of animal.	Date.	8 a. m.	9 a. m.	10 a. m.	11 a. m.	1 p. m.	2 p. m.	3 p. m.	4 p. m.	5 p. m.
86	Sept. 3, 1897	101.6	103.0	102.3	102.5	102.6	101.7	101.7	102.1	102.8
86	Mar. 25, 1898	100.8	101.8	101.3	100.9	101.0	100.9	100.9	101.7	100.0
86	Sept. 4, 1897	101.6	101.8	101.6	101.6	101.0	101.5	100.4	102.1	102.6
86	Mar. 25, 1898	100.4	100.7	100.6	100.1	100.4	100.4	100.4	99.9	98.4
87	Sept. 3, 1897	101.6	101.6	101.0	101.5	101.7	102.2	102.1	102.6	102.6
87	Mar. 25, 1898	100.5	99.8	100.5	99.4	100.2	100.9	100.9	99.9	100.6
87	Sept. 4, 1897	101.5	101.6	101.5	101.7	101.0	101.6	101.6	101.6	101.5
87	Mar. 25, 1898	100.2	101.0	101.0	100.8	101.2	100.3	98.2	98.6	97.4
88	Sept. 3, 1897	101.2	101.4	101.0	101.4	101.4	101.7	101.5	101.9	101.6
88	Mar. 25, 1898	101.2	102.0	102.0	101.9	101.9	101.0	101.0	101.0	101.5
88	Sept. 4, 1897	101.0	101.4	101.1	101.6	101.2	101.1	101.4	101.1	101.5
88	Mar. 25, 1898	100.1	101.2	101.3	101.0	101.2	101.2	101.3	101.4	101.1
89	Sept. 3, 1897	101.1	101.0	100.2	101.1	101.3	102.3	102.0	101.6	101.9
89	Mar. 25, 1898	100.7	100.6	99.8	100.3	100.2	101.0	99.2	99.9	100.0
89	Sept. 4, 1897	100.9	100.5	100.9	101.3	101.0	100.9	101.3	101.4	101.5
89	Mar. 25, 1898	99.7	99.6	100.0	99.7	100.0	99.6	99.7	99.7	99.1
90	Sept. 3, 1897	100.8	100.7	100.6	100.3	100.2	100.4	100.4	100.7	101.1
90	Mar. 25, 1898	100.6	100.4	100.4	101.0	100.3	99.8	100.7	100.0	100.8
90	Sept. 4, 1897	100.6	100.5	99.9	100.7	100.5	100.2	100.3	100.3	100.9
90	Mar. 25, 1898	100.2	100.9	100.9	100.8	101.0	100.6	101.1	100.7	101.2
91	Sept. 3, 1897	101.3	101.2	101.1	101.3	101.5	101.6	101.7	102.1	102.6
91	Mar. 25, 1898	101.2	100.4	100.1	100.3	99.4	101.2	100.9	100.0	99.5
91	Sept. 4, 1897	101.1	101.5	101.0	100.8	101.0	101.2	101.5	102.2	102.2
91	Mar. 25, 1898	100.0	101.0	101.3	101.1	100.5	101.4	101.0	101.0	99.9
92	Sept. 3, 1897	101.5	101.8	101.4	101.5	101.6	101.4	101.7	101.9	101.9
92	Mar. 25, 1898	100.1	100.3	100.8	99.7	100.0	99.9	100.3	100.5	99.3
92	Sept. 4, 1897	101.6	101.6	101.1	101.2	100.4	100.9	100.4	101.8	101.8
92	Mar. 25, 1898	100.2	100.2	99.1	100.3	99.5	100.5	99.8	99.8	99.9
93	Sept. 3, 1897	101.1	100.9	102.3	100.7	100.8	101.2	101.2	101.4	101.6
93	Mar. 25, 1898	99.6	99.6	100.0	99.6	100.2	99.8	100.5	100.0	99.7
93	Sept. 4, 1897	101.1	101.4	101.4	101.4	100.7	101.1	101.0	101.0	101.4
93	Mar. 25, 1898	100.2	99.8	100.0	99.8	99.8	100.1	99.5	98.0	100.2
94	Sept. 3, 1897	101.6	101.4	101.3	101.5	101.8	102.2	102.5	101.6	101.7
94	Mar. 25, 1898	99.9	99.4	99.6	99.8	99.6	99.1	98.9	99.7	100.2
94	Sept. 4, 1897	101.7	101.6	101.9	102.1	102.0	102.5	102.6	102.4	103.3
94	Mar. 25, 1898	100.0	100.5	99.9	99.7	100.2	99.7	100.0	99.7	99.9
95	Sept. 3, 1897	102.0	101.7	101.5	101.5	101.2	101.6	101.8	101.6	102.0
95	Mar. 25, 1898	101.2	100.5	100.3	99.9	100.0	100.1	99.9	99.8	100.5
95	Sept. 4, 1897	101.7	101.6	101.7	101.9	100.8	101.4	100.9	101.0	101.2
95	Mar. 25, 1898	100.0	100.1	100.0	99.7	99.9	100.1	100.0	99.5	100.0
96	Sept. 3, 1897	101.3	102.2	100.8	100.9	101.0	101.5	101.3	101.8	102.0
96	Mar. 25, 1898	99.3	99.7	100.2	99.7	100.1	99.8	99.7	99.8	99.4
96	Sept. 4, 1897	101.3	101.2	101.4	102.9	101.4	101.0	100.9	101.4	101.7
96	Mar. 25, 1898	100.5	100.8	100.9	100.2	100.0	100.0	99.0	99.0	98.8
97	Sept. 3, 1897	102.4	103.4	102.0	102.1	102.4	103.6	102.9	103.8	103.0
97	Mar. 25, 1898	101.0	100.8	100.7	99.7	99.4	100.3	100.3	99.9	100.0
97	Sept. 4, 1897	102.1	102.6	102.4	103.2	102.7	103.0	103.6	102.4	102.6
97	Mar. 25, 1898	101.0	100.2	100.8	100.0	100.1	100.0	99.2	97.9	98.7
98	Sept. 3, 1897	101.0	101.3	101.2	102.1	100.8	101.7	101.5	101.3	101.2
98	Mar. 25, 1898	99.9	100.1	99.6	99.4	99.2	99.5	99.6	100.0	99.6
98	Sept. 4, 1897	101.2	101.3	101.0	102.1	100.2	100.9	101.4	100.7	101.0
98	Mar. 25, 1898	100.2	100.2	100.6	100.0	99.2	99.8	99.6	100.1	100.0
99	Sept. 3, 1897	102.2	101.0	100.6	102.8	100.9	101.9	101.7	102.1	102.1
99	Mar. 25, 1898	100.3	100.3	100.7	98.9	98.9	100.9	100.5	99.6	99.5
99	Sept. 4, 1897	101.9	101.9	101.6	102.0	101.2	101.9	101.9	101.9	102.0
99	Mar. 25, 1898	100.0	100.1	100.7	100.0	101.0	100.0	100.0	99.3	99.2
100	Sept. 3, 1897	102.4	101.3	101.7	102.2	102.1	102.0	101.9	101.9	102.0
100	Mar. 25, 1898	99.2	100.2	100.0	100.4	99.1	98.6	98.5	99.6	99.6
100	Sept. 4, 1897	101.1	101.5	102.2	102.3	101.5	101.2	101.5	101.6	101.1
100	Mar. 25, 1898	100.0	99.2	100.4	101.0	101.4	101.4	99.7	99.5	98.2

The spring temperatures are evidently lower than those taken in September. This may, of course, be due to other influences than atmospheric temperature, such as inactivity during the winter months, and the absence of flies during the winter months and March. The cattle cannot be said to have been inactive during March for they had enjoyed their freedom in a large lot, and appeared to exercise about as much, if not more than during the hot days of September. The flies may be instrumental in raising the temperature, yet it does not seem that they would make animal heat uniformly higher while the cows were stabled. Everything seems to indicate that this uniform reduction of temperature is to be found under the direct influence of atmospheric temperature. If this is true, changes in atmospheric temperature should be watched with great care. Whether the atmospheric temperature acts directly upon the animal or indirectly by the stimulation of some function, it would make little difference so far as the results are concerned. Instances have been cited me by Dr. Dunphey, State Veterinarian, where he has been entirely misled by the sudden change in atmospheric temperature.

DO LOWER OR HIGHER NORMAL TEMPERATURES OCCUR ON THE SECOND DAY THAN ON THE FIRST DAY OF THE TEST?

We shall select the normal maximal temperatures for two successive days just as in a test to determine the above question. The normal maximal temperatures are used in summing up results for judgment, consequently are peculiarly fitting for answering this question.

+Means higher maximal temperature on second day.

—Means lower maximal temperature on second day.

oMeans the maximal temperatures are the same.

No. of animal .....	{	16	2	23	22	69	67	59	77	82	78	74	79
		—	—	—	—	+	+	+	+	+	o	+	—
No. of animal .....	{	80	76	85	72	75	105	100	104	108	116	o	—
		+	+	—	—	—	—	+	+	+	+	+	—
No. of animal .....	{	93	96	87	103	107	83	99	97	109	110	111	—
		+	+	+	+	—	—	+	o	—	—	—	—
No. of animal .....	{	86	94	18	91	101	90	89	92	93	103	95	—
		—	+	—	+	—	+	—	—	—	—	—	—
No. of animal .....	{	39	128	127	44	125	43	123	126	124	—	—	—
		+	—	—	+	+	+	+	+	+	+	+	—
No. of animal .....	{	122	52	121	53	133	112	113	120	68	—	—	—
		—	+	+	+	o	+	+	+	+	+	+	—
No. of animal .....	{	114	117	119	70	115	118	14	13	15	11	9	—
		—	+	+	—	—	—	—	+	+	+	+	—
No. of animal .....	{	6	29	57	56	63	20	17	2	5	7	9	13
		—	—	—	—	+	—	+	—	—	+	o	—
No. of animal .....	{	14	16	17	23	44	52	53	59	75	86	87	—
		—	—	o	+	—	—	+	—	—	—	—	—
No. of animal .....	{	88	89	90	91	92	93	94	95	96	97	98	o
		—	—	—	—	—	—	+	+	+	+	+	—
No. of animal .....	{	99	100	101	103	104	105	106	107	108	109	110	111
		—	—	—	—	—	—	+	+	+	+	+	+
No. of animal .....	{	109	110	111	112	113	114	115	—	—	—	—	—
		+	—	+	—	+	—	+	—	—	—	—	—

Total number of comparisons of normal maximal temperatures, 123.

Total number of maximal temperatures where the second day exceeds that of the first, 44.



Total number of maximal temperatures where the first day exceeds that of the second, 72.

Total number of maximal temperatures where the first day equals the second day, 7.

This indicates that the temperatures run a little lower on the second day than on the first although it cannot by any means be depended upon.

#### TIME OF DAY WHEN THE MAXIMAL AND MINIMAL TEMPERATURES OCCUR.

This study does not include the twenty-four hours of the day, but is confined to those hours in which the temperatures are most likely to be taken. The normal temperatures alone are used.

The total number of temperatures during the given hour is found, then the number of maximal and minimal temperatures occurring during that hour. By following this method a fair idea of the hours, in which the maximal and minimal temperatures are to be found, can be obtained.

March 28 and 29, 1898.				September 3 and 4, 1897.			
No. of temperatures taken.	Time.	No. of maximal temperatures occurring.	No. of minimal temperatures occurring.	No. of temperatures taken.	Time.	No. of maximal temperatures occurring.	No. of minimal temperatures occurring.
98	7 a. m.	22	8	15	7 a. m.	3	2
193	8 a. m.	33	34	36	8 a. m.	13	17
196	9 a. m.	30	11	36	9 a. m.	3	11
196	10 a. m.	29	23	36	10 a. m.	2	24
196	11 a. m.	14	31	36	11 a. m.	7	16
196	1 p. m.	15	39	36	1 p. m.	5	15
196	2 p. m.	17	16	36	2 p. m.	6	2
196	3 p. m.	8	19	36	3 p. m.	13	4
196	4 p. m.	18	24	36	4 p. m.	22	3
196	5 p. m.	17	30	36	5 p. m.	27	3

It is readily seen that no reliance can be placed upon any hour as representing the highest number of maximal temperatures or minimal temperatures. Furthermore, there is a great difference in the relation of maximal and minimal temperatures in the two tests given. In March, the five o'clock hour has a larger number of minimal temperatures than maximal temperatures, while in September the order is strikingly reversed. This is more or less true throughout the table, no harmony prevailing at all. We cannot select any hour, therefore, with the hope of securing the maximal temperature and allow it to stand as a representative normal temperature. A large number of normal temperatures are required to give a satisfactory notion upon which to base judgment.

#### A RESPONSE TO TUBERCULIN.

We have placed the stress of our work upon normal temperatures, for they are in reality the foundation of interpretation. Knowing what the normal temperatures may lead to, any deviation from the normal may

be more readily detected, but unfortunately our knowledge has not yet reached a point where absolute reliability is assured.

By a response to tuberculin or a reaction we understand that a rise of temperature has been produced by the injection of tuberculin in a tuberculous animal and that a febrile condition exists in the animal. It is this response to tuberculin which enables us to decide whether an animal has tuberculosis or not. Should there be the slightest rise in temperature or a very marked rise in temperature that is due to tuberculin, tuberculosis is probably indicated. On the other hand, a rise of temperature may occur from some other cause than tuberculin, when it is expected that it will result from tuberculin only. Our investigations thus far establish the possible variations which may occur in the normal temperatures from various unknown causes, consequently we are not in a position to state whether this rise of temperature is produced by tuberculin or by some other agent. Errors are likely to occur and will happen even to the extent, perhaps, of fifteen per cent. in some herds, but usually the errors will be much less. If a herd is to be freed from tuberculosis, the errors will have to be controlled by a cautious study of each animal's normal temperatures, and then, although the errors may be greatly lessened, a small per cent. will still persist.

There are characteristics which will assist us in deciding whether a rise of temperature is attributable to tuberculin:

First, There is a gradual rise of temperature beginning eight to sixteen hours after injection;

Second, This rise reaches the maximal point in a few hours, then gradually falls back to normal;

Third, This febrile condition persists through several hours;

Fourth, The extent of rise may be measured by one or more degrees which cannot be fixed and must be considered in connection with other features;

Fifth, There is sometimes an irregular febrile condition, which is difficult to interpret. This condition is more likely to take place in animals much advanced in tuberculosis, yet it is by no means generally true.

These statements are based upon the tables and are drawn from those numbers marked with a +. In reviewing the numbers thus marked it must be remembered that in some cases there is no reaction at all and that it means, the animal had once responded but had failed in that particular test, for it is established beyond dispute and long recognized that cattle will not respond to tests made every six months or every year, although they had reacted previously.

The errors which may creep in even by recognizing the above characteristics should be mentioned. Each characteristic is not infallible, it simply is the best guide we are able to give. Turn to Table XVI, Nos. 6 and 17, and there will be found what would be considered typical reactions. Others are present in the tables. Such "normal reactions" cannot be differentiated from "tuberculin reactions."

So far as a close analysis of reactions is concerned, it scarcely seems necessary to make one after the extensive study of normal temperatures, and the designation of reactions in the tables. If the temperatures before the injection of tuberculin are understood, the temperatures after injection will be easily interpreted.

## TENTATIVE CONCLUSIONS.

1. Tuberculin is the best diagnostic known for tuberculosis.
2. Tuberculin itself may be infallible, but its application and interpretation are not.
3. An arbitrary point of condemnation is unwarranted.
4. To succeed in eradicating tuberculosis from a herd, the tuberculin test must be applied persistently at intervals for as yet an undetermined time.
5. The slaughtering of animals reacting to tuberculin is not justified, unless the physical condition of the animal confirms the tuberculin test and makes it a wise precaution. [Reacting animals should be isolated.] Should a second test diagnose tuberculosis, slaughter is possibly made justifiable unless the animal is sufficiently valuable to isolate for her offspring or in hopes of recovery.

I wish to acknowledge my great indebtedness to Prof. E. A. A. Grange for the most important part he has occupied in this bulletin and for his timely suggestions.

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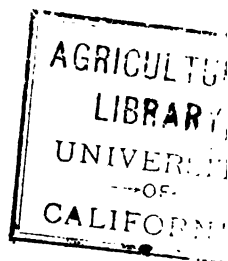
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**BULLETIN 160**

**JUNE, 1898**



**MICHIGAN**

**STATE AGRICULTURAL COLLEGE**

**EXPERIMENT STATION**

**ENTOMOLOGICAL DEPARTMENT**

**SOME INSECTS OF THE YEAR 1897**

Prepared under the direction of  
**WALTER B. BARROWS**  
Consulting Zoologist of the Experiment Station

**BY RUFUS H. PETTIT**  
Assistant Entomologist

**AGRICULTURAL COLLEGE, MICHIGAN**  
**1898**



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*The Bulletins of this Station are sent free to all newspapers in the State and to such individuals interested in farming as may request them. Address all applications to the Secretary, Agricultural College, Michigan.*

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## INTRODUCTORY.

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During the year 1897 the Zoölogical Department of the Experiment Station has received and answered many hundreds of inquiries relating to insects, some of which, although fairly common always and abundant occasionally, do not appear to be well known to the farmers and fruit-growers of the State. It has seemed best, therefore, to publish a few notes relating to certain of these insects, with the hope that such a bulletin many not only prove helpful at once to many residents of the State, but that its general distribution may lead to an increased correspondence and better acquaintance with the active agriculturists of the State, and to a better knowledge on our own part of the insect enemies of our crops.

Notes are given here of twenty-eight species of insects, but it must not be supposed that these are the only ones which have caused damage, or even the ones which have caused the most damage during the past year. More or less loss is occasioned every year by the Hessian-fly, the chinch-bug, the plum-curculio, the codlin-moth, the tent-caterpillar, the squash-bug, cut-worms, wire-worms, and a host of other common insects, no one of which is treated in this bulletin. It is impracticable to publish in a single bulletin a treatise which shall cover *all* our insect enemies, and the selection made here is believed to be the most serviceable, all things considered, that could be arranged at this time.

In this connection, a few words of advice to correspondents may not be amiss. Whenever information is wanted in regard to any insect, insect work, or insecticide, the proper person at the College to address is not anyone whom you may know personally, or by name or reputation, but simply "the Entomologist of the Experiment Station," Agricultural College, Mich. Inquiries addressed in this way are sure to reach this department directly and to receive attention at the earliest possible moment. If addressed otherwise, delay may occur for various reasons, and in some cases the loss of a single day might endanger an entire crop.

It is well to remember that the most careful description of an insect is seldom as good as the insect itself, while in most cases a mere fragment of the actual insect is better than a page or two of description. Therefore in writing for information about any insect always enclose a specimen if possible, no matter how common or well known you may believe it to be; and if no sample of the insect can be found, send a sample of its work. In sending specimens by mail, they should be sent in glass or tin if possible, and with some of their natural food if alive. Leaves and



fruits wilt rapidly if enclosed in wood or pasteboard boxes, and are also very likely to be crushed or broken in transmission. Small tin boxes of any shape may be used, and it is well to put a slip of paper with the address of the sender inside the box, in case the outer wrapper should be torn off or defaced. If a letter is enclosed with the specimens, the whole package is subject to letter postage; if the two are sent separately, they should be addressed exactly alike, and the package of specimens should be marked with the sender's name and address *invariably*. Failure to attend to this simple rule has led to more disappointment and trouble than would be supposed. Rarely does a week pass when we do not receive specimens without letters, or letters without specimens which are said to have been sent; and it is no uncommon thing during the height of the season to receive half a dozen packages by the same mail and to be unable to decide which are the insects referred to in letters received at the same time. Always send insects alive if possible, but send in strong, tight boxes—insects need no air-holes whatever. Never try to kill scale insects or others by dipping in kerosene or other insecticide before mailing. Always state definitely what harm, if any, the insect is supposed to be doing, and whether it is abundant or scarce.

The bulletin is mainly the work of Mr. Rufus H. Pettit, the efficient Assistant Entomologist of the Station, and I take pleasure in acknowledging at this time his cordial and intelligent help in all the various functions of our several positions, and in expressing my satisfaction with the manner in which all his duties have been performed. I would also tender my thanks to Dr. L. O. Howard, chief of the Division of Entomology, of the United States Department of Agriculture, for the use of several electrotypes, credit for which is also given with each cut, and to Professor M. V. Slingerland of Cornell University for similar favors.

## SOME INSECTS OF THE YEAR 1897.

## GRASSHOPPERS.

*Melanoplus femur-rubrum* and *M. atlantis*.

In spite of the wet spring weather, grasshoppers did considerable damage in the western part of the State. Numerous reports of invasions reached us, although in few cases was the injury great. Specimens of the hoppers sent from the infested districts proved for the most part to be *Melanoplus atlantis* and *M. femur-rubrum*. These are known as the lesser migratory and the red-legged locusts respectively. (Fig. 1.)



FIG. 1. Red-legged Locust (*Melanoplus femur-rubrum*).

The best known remedy for grasshoppers is fall plowing for the destruction of the eggs. Where this practice can be regularly carried on over large areas the grasshoppers are not likely to become troublesome, but there is always some stump-lot or neglected lane which would be difficult or impossible to plow, or else there is some farmer who will refuse to plow his land, and these lanes and unplowed lots will furnish places for the hatching of enough locusts to infest an entire neighborhood.

The eggs are laid in pods containing about twenty-five or thirty eggs. These pods are made of mucus, which is given out with the eggs during the process of laying and dries down hard, becoming brittle and impervious to moisture. The eggs are thus provided with a water-proof covering about three-fourths of an inch long and smaller in diameter than a lead-pencil. The pods are concealed in holes in the sod in which they were formed. These fragile little pods of eggs are open at the upper end, providing a place for the escape of the young locusts. Now if the sod be plowed under, most of the egg-pods are turned wrong side up, besides being buried so deep that the young locust will never be able to escape; then, too, many are broken, and moisture thus gains entrance and leads to the destruction of the eggs. It is likely, also, that the plowing will expose many to their natural enemies, such as birds, shrews, mice, etc. A good rolling after the plowing and dragging will pack the dirt so tight that very few will escape. To be of the most value, the plowing must be general; no strips along fences, no lanes of any size,

and no clearings containing brush and stumps should be allowed to seed the rest of the farm. When it is absolutely impossible to turn the sod under in these places, recourse may be had to another remedy, viz., *poisoned baits*. Bran mixed with Paris green, using  $1\frac{1}{2}$  to 2 lbs. of the poison to 25 lbs. of bran, should be stirred up with water to the consistency of dough; sometimes cheap molasses is added to make it stick together better. This is made up into small balls and placed about the field. The greatest care must be observed for a long time after using these baits that no live stock or poultry be allowed to gain access, and if it is impossible to completely exclude them it is best not to use the baits.

Another plan, which is perhaps the most universally used because it can be employed after the young brood appears in the early summer, and also because it does not require the use of poison, is the hopperdozer (Fig. 2). This is a long, shallow pan of sheet-iron set on runners and

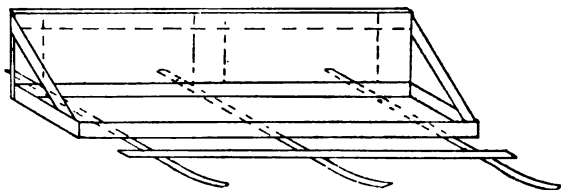


FIG. 2. Hopperdozer.

having behind it a banner or sail made of canvas or muslin stretched on a wooden frame. The bottom of the pan is covered with rags or old carpet previously wetted with water. When all is ready a pint of kerosene is poured into the pan and distributed over the wet rags, and the banner of cloth is also moistened with kerosene. The dozer is then dragged on its runners over the field and the hoppers either jump in or try to jump over, in which case they strike the banner and fall back into the oil. A mere touch of the oil is certain death; it may take a minute if the insect falls directly into it, or it may take half an hour if the insect simply alights on the banner moistened with the oil; but no matter whether the insect dies immediately or requires a little time, he is sure to die eventually, as has been proved time after time. The great majority of the hoppers that jump into the pan jump out again at once, but they die just as certainly and almost as quickly as if they remained.

Hopperdozers are useful on open spaces only, and their size may vary from four feet long to about twenty feet. The shorter styles can be used to advantage in lanes and in places partially covered with trees or brush, and the longer styles on smooth, level plains. It is often found expedient to fasten two or three side by side, as they follow the inequalities of the ground more evenly than a single wide one. They can be used to drag around a field of grain, after cutting a strip wide enough to allow the dozer to pass, preventing in a great degree the migration of the grasshoppers into the grain. Grasshoppers do not like moisture, and they usually gather in the open spots when the dew is on the grain, to return when the warmth of the day has dried everything. At such times the hopperdozer is especially useful.

## THE PEAR PSYLLA.

*(Psylla pyricola.)*

A pest on the pear which promises to become very serious has been found recently in considerable numbers in our State. According to Prof. Slingerland, this insect, the pear psylla, was probably first introduced into Connecticut from Europe in 1832. In 1838 it had spread over Massachusetts and part of New York. Since that time it has extended to Illinois and was found in Michigan by Mr. Schwarz before 1891. Recently it has been found in Kent county, where it has done considerable damage.

## INDICATIONS OF ITS PRESENCE.

The presence of this little pest is usually indicated by a general loss of vitality of the tree early in the season. The young shoots wilt and droop, and by midsummer most of the leaves and fruit fall from the trees. Another indication of its presence is the liquid called honey-dew, which is secreted in large quantities and which spreads over the branches and even falls from them in drops. This sweet liquid attracts many ants, bees, wasps, etc., and often supports a black fungus growth later in the season.

## DESCRIPTION OF THE INSECT.

Although capable of doing incalculable injury because of the myriads which infest a single tree, the individual insects are very small, measuring less than an eighth of an inch when mature and considerably less in the immature stages. The young (Fig. 3) are at first yellow in color,

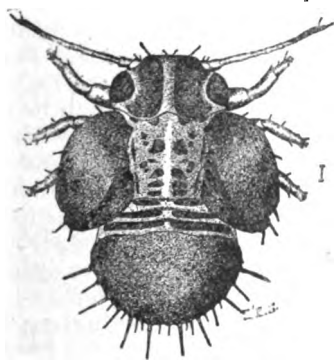


FIG. 3. Pear Psylla (*Psylla pyricola*), young  
(after Slingerland).



FIG. 4. Pear Psylla (*Psylla pyricola*),  
adult (after Slingerland).

afterward becoming spotted with reddish and black. These little fellows hatch from the eggs about the middle of May and immediately commence sucking the sap from the trees, usually choosing the sheltered

place between the base or petiole of the leaf and the twig. Here they grow, and in the course of about a month change to the winged or adult form (Fig. 4). In this stage the insects have strong jumping legs and powerful wings, which enable them to escape when approached or when an attempt is made to spray them. Several broods are raised during the season, and the insect passes the winter either as an adult or immature.

While the pear psylla may be present for some time without a serious outbreak, it is certain to multiply to an enormous extent when all the conditions are favorable, and usually when least expected.

#### REMEDIES.

Most of the injury is done before the middle of June, and as the insects are destroyed most easily when in the immature stage, two or more *thorough* sprayings with kerosene-emulsion during the last week of May and the first week of June will so reduce the pests that very little injury is to be feared for the rest of the season. The emulsion should be made according to directions given in the chapter on insecticides, and should be diluted with fifteen times its volume of water. A winter wash of whale-oil soap undoubtedly would kill great numbers of the insects, which always pass the winter on the twigs and branches or in crevices of the bark.

Spraying at any time after the eggs hatch will prove beneficial, but experiments have shown that the best results may be obtained at the times indicated.

#### PLANT LICE OR APHIDS.

If there is any group of insects that requires the constant attention of nurserymen, green-house owners, orchardists and farmers, it is the family of plant-lice or aphids. The season of 1897 has been unusually favorable for these vermin, as is always the case when the spring opens moist and cloudy, with very little hot weather early in the season. Such widespread and well-known pests require very little description; their small, pear-shaped bodies, rarely exceeding one-quarter of an inch in size, with the slender legs and feelers, are known to everyone. The life-histories of these plant-lice are, however, not so well known, and in many cases they are as yet a mystery. Many species pass the winter in the egg stage, although a large number of species are not yet known to produce eggs. The "winter eggs," hatching in the spring, produce wingless females, which bring forth living young without the intervention of the male. In some cases these young produce in turn winged females, in other cases wingless females (but these, whether winged or wingless, have the same power of producing young without pairing), and in the great majority of cases, if not in all, this method of reproduction is carried on until fall. Then in some cases males and females are produced, which, after pairing, give rise to one or more eggs, which serve to keep the species over winter. In many instances, as with the black peach-aphis and the grain-aphis, the aphids themselves live over winter. In some cases, as in the case of the hop-aphis (*Aphis humuli*), the winter eggs are laid on

one plant (in this case on the plum), while the young migrate to some other plant in the spring. The hop-aphis migrates from the plum to hop-vines and passes the summer there.

Aphids are sucking insects, taking their food through a slender tube which is thrust deep into the tissue of the plant. For this reason any arsenical poison that may be deposited on the surface of the plant will do them no harm; they will thrust their beaks clear through the poison into the plant and will suck the sap from beneath the surface. To kill these little robbers it is necessary to use contact poisons, such as kerosene-emulsion, whale-oil soap, tobacco-water, Pyrethrum, or some application which kills by closing up the pores or by irritation, or else to use some vapor, smoke, or gas, such as tobacco-smoke or carbon bisulphid. In exceptional instances, as in the case of lice that live underground, it is necessary to use some special treatment.

#### APHIDS OF PLUM, CHERRY, AND APPLE.

(*Aphis prunicola*, *Myzus cerasi*, *Aphis mali*.)

During the spring and early summer, few days pass without bringing some inquiry as to the method of getting rid of the lice on one of these trees. As these three species of lice all yield to the same treatment, it seems expedient to discuss them together.

The apple-louse passes the winter in the form of an egg. These oval eggs are very characteristic; they are black in color after they have been laid for some time, and are usually crowded together in large numbers. These are very difficult to destroy, and thus far nothing has been found which will do any good without killing the tree as well. As soon as the buds burst in the spring, the young lice crowd on to them and commence to suck. They remain on the leaves for some time, but usually disappear in the early summer to reappear again in the fall at the time of depositing eggs.

The plum and cherry aphids differ in some respects, but the life-history in general is similar. They may be easily killed by a spray of kerosene-emulsion (Hubbard formula), diluting the emulsion ten times, or by a spray of whale-oil soap, using one pound of the soap to six gallons of water. In the case of the cherry-aphis it is best to apply it a little stronger, as this louse is able to stand more than the others. Tobacco-tea, made strong, is used by many with success, but whatever is used must be applied thoroughly, for each louse must be hit to be killed.

## THE BLACK PEACH-APHIS.

(*Aphis persicae-niger* Smith.)

Next to the San José scale, the worst enemy to the peach in our State is the black peach-aphis (*Aphis persicae-niger*). This dangerous pest was first recognized in Michigan during the year 1889 by Dr. Erwin F. Smith.\* Like the wooly aphis of the apple, this louse does not confine its operations to the branches and trunk of the tree, but works on the roots as well. It may be found on almost any part of the roots, but seems to prefer the smaller rootlets, on which it gathers in great numbers. Its work on the branches and leaves, while of a very serious nature, is not so dangerous to the tree as that on the roots. Ordinarily the lice may be found on both leaves and roots at the same time, but they may confine themselves temporarily to either one, the proportion underground varying at different seasons and according to the character of the soil. Sandy soil seems to be favorable to the root-form, while stiff clay is less liable to harbor them, although they may become troublesome even in the stiffest clay soil.

The insect itself is a small black louse, either winged or wingless. The winged form is about one-twelfth of an inch in length and measures a little more than one-quarter of an inch across the wings from tip to tip. The wingless form is somewhat smaller. In color the insects are shiny black except on the under side, which is dark, shiny brown.

While this shiny black louse is easily distinguished from other lice infesting the peach, it is well with the aid of a microscope to examine the roots, when its presence is suspected, and if found there to send a quantity of specimens in a tight tin box to the consulting entomologist for accurate identification.

The effect of root-lice is apparent in the sickly appearance of the trees (Fig. 5). Their most serious depredations are committed on young trees, whose stunted or dwarfed and starved appearance first attracts attention. The leaves turn yellowish, usually become somewhat curled, and it is said that the general appearance is suggestive of the first stage of yellows. Of course the only real proof lies in finding the insect, either on the leaves or on the roots.

## REMEDIES.

Unfortunately, as these lice live both on the leaves and on the roots, the work of extermination requires concerted action against them in both of these places. The leaf or aerial lice are easily disposed of by a spray of kerosene-emulsion (Hubbard formula), using one part of the emulsion to ten of water; or by a spray of whale-oil soap at the rate of one pound of soap to six gallons of water; or strong tobacco-water may be used in the form of a spray. The root-inhabiting form, however, requires a more laborious and expensive treatment. Probably the best remedy for root-lice is tobacco-dust. It must be *dust* and not merely waste or chopped tobacco, for experiments have proved that coarse tobacco is

\*Ent. Amer. 1890, pp. 101 and 201.

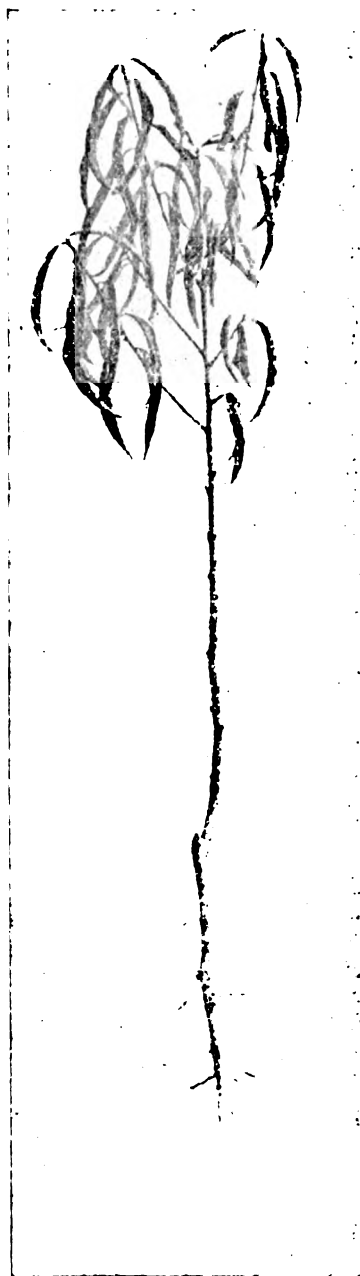


FIG. 5. Young peach tree affected with Black Peach Aphis  
(*Aphis persicae-niger*). (Original.)



very inferior to dust, for the reason that the coarse particles require a good deal of time for the nicotine to leach out, preventing a thorough drenching of the roots with nicotine water all at once, as is the case where fine dust is used. The slower action of the coarse tobacco kills some lice to be sure, but much of the nicotine decomposes before it is extracted and the soil water never becomes strongly laden with the poison. The soil over the roots should be removed to the depth of several inches and the dust dug in about the roots, after which the soil should be replaced; or a trench may be dug around the tree at a distance of about two feet and then covered again after a liberal supply of the tobacco-dust has been put in. If possible this work should be done before a rain, but a thorough artificial drenching will answer the purpose. Tobacco-dust should cost one or two cents a pound, and it is worth that much as a fertilizer even if it were of no value on account of its insecticidal powers.

Another remedy said to be very useful is kainit. Prof. J. B. Smith of the New Jersey Experiment Station recommends it very strongly.\* Kainit is a potash salt which is very efficient as a fertilizer. It should be used at the rate of about ten pounds to a five or six-year tree and may be spread on the surface of the ground over an area about as large as the roots are supposed to cover, care being taken not to let it come in contact with the crown, or in fact within several inches of it. Wood ashes used in the same way may also prove efficacious.

All stock purchased from places where this aphid is found should be carefully treated to destroy any lice or eggs that may cling to the roots. Strong tobacco-water is a safe and effective wash for this purpose. Whale-oil soap, using one pound of the soap to six gallons of water, will no doubt prove a useful and effective remedy. Hot water at 130° Fah. will also kill the lice without injury to the stock, if not immersed too long.

## THE WOOLY APHIS OF THE APPLE.

(*Schizoneura lanigera*.)

Ranking about equal to the black peach-aphid is the wooly aphid of the apple. Both of these insects have root-inhabiting forms, which renders their extermination very much more difficult than in the case of species living only above ground. The wooly aphid takes its name from the secretion of wool-like flocculent matter covering its body. This wooly covering renders the lice very conspicuous when clustered on the branches of a young apple-tree. Large, knotty swellings are produced on the branches where the lice congregate, and smaller knots and swellings are produced in the same way on the roots (Fig. 6, a). The most serious injury from these wooly-lice is done to young stock, but larger trees suffer as well. When numerous on the roots, the latter become deformed and after a time rot, leaving the plant seriously handicapped for want of sufficient food and support. This fact makes itself apparent by the general appearance of the tree, which becomes sickly and may die finally. The

\*Economic Entomology, p. 131.

cause of all this trouble is ordinarily easy to detect because of the appearance of the insects on the branches, where they produce knots.

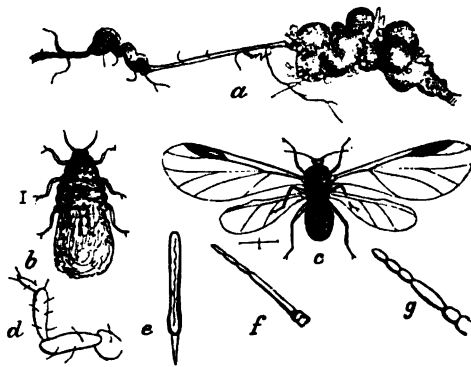


FIG. 6. Woolly Aphis of Apple (*Schizoneura lanigera*); a, galls caused by them on apple root; b, wingless, wax-coated form; c, winged form.

This insect has long been known in the east as a very destructive and important pest. It now exists in some parts of Michigan, but is not as yet widely spread over the State. Every precaution should be taken to prevent its further distribution, and where already established a strong effort should be made to eradicate it if possible. The same remedies that are recommended for the black peach-aphis will prove effective here.

#### SCALE INSECTS OR COCCIDS.

Few other families of insects present such an array of strange and varied forms as the family of scale-insects. In this family of anomalies the females are all blind, wingless, and many of them footless as well, while the adult males are provided with wings, feet, and eyes.

The family takes its name from the scale or covering with which most of its members are provided. Nearly all are small or minute insects, few exceeding one-eighth of an inch in size, while most of them are smaller still. The scale or covering serves the part of a tent or shield to protect its inmate. Among the different species this shield or scale varies greatly in size, color, and form, and in some cases is wanting altogether, but when present it consists of a thin, papery or waxy shelter raised at the center, something after the manner of a limpet, and concealing its inmate in the space thus formed. The cast-skins of the insect are usually borne on the top or at the end of the shield. A number of closely allied insects, that show close affinity on account of similarity of structure, are classed among the scale-insects although they are not provided with a separate scale.

The young of all these scale-insects are small oval lice, which run about freely for a short time. As they are very minute and active, they may easily pass on to the feet of birds and insects and be transported long distances by them, when, if they alight on their appropriate food-plant, the young scale-insects may start new colonies.

The young louse, after finding a suitable place, settles down and inserts its long, thread-like beak into the plant and abstracts its first meal. In some species the beak is never withdrawn, but the insect becomes attached to this place and never moves from it.

During the growth of the true scale-covered insect, the male sheds its coat twice and the female three times. The female loses legs and antennæ at the first molt and becomes a mere sac, with a long, hose-like mouth, capable only of absorbing food and getting ready to lay eggs. The fringe-like spinning apparatus by which the scale is secreted is situated at the rear end of the body, and by the arrangement of the different parts of this fringe the species are classified.

In due time the male changes to the pupal stage and develops wings, antennæ, legs, etc., but as its life is to be very short, it has no need for a mouth, and a second pair of eyes takes its place.

After the sexes pair the eggs are laid, the female gradually shriveling up and making room for them under the scale as fast as they are laid. The eggs hatch at various seasons, depending on the species. Some pass the winter in the egg state, while others winter in a half-grown condition and deposit the eggs in the spring. In some naked species not furnished with a true scale the eggs are laid under the body of the mother, which shrivels up as they are laid until finally she dies, leaving her shriveled skin as a shelter for her eggs until they hatch.

#### SAN JOSÉ SCALE.

(*Aspidiotus perniciosus* Comst.)

The most important insect pest of 1897 has been the San José scale. Although a single infested orchard had been found in 1896, the danger from the scale was not fully realized until recently, when a number of badly-infested orchards have been located.

Even at the present time (June, 1898,) the status of this pest in Michigan is by no means well known. The appointment of an "Inspector of Orchards and Nurseries" in September, 1897, led to some investigation as to its presence in various sections, but in order to comply with the provisions of the law relating to nursery stock the inspector was compelled to give practically his entire time to the examination of the stock of nurserymen and dealers, so that no inspection of orchards was practicable. In January, 1897, the addresses of more than 400 persons in Michigan were obtained who had received stock from infested nurseries in the east, and examination of less than fifty such cases revealed the presence of the scale in five. It was impossible for the department to investigate satisfactorily the remaining 350 or more cases, and although the recipients of suspected stock were all notified of the danger, and many of them have stated most positively that their places are entirely free from the scale, yet it is almost certain that the pest was introduced in some of these shipments and that it will be found eventually in some of these suspected localities. Already, almost by accident, it has been located at several places in the State not on the suspected list, and the

origin of some of the worst cases of infestation thus far found is still unsettled. There can be little doubt that irresponsible dealers and careless agents in many instances have furnished infested stock to unsuspecting purchasers, and for this reason it may never be possible to trace the infection to its source.

It may or may not be possible to exterminate this pest as it is discovered, and to keep it out of the State hereafter, but unquestionably it is the duty of every loyal citizen to report at once the presence of any suspicious insect and to allow the most thorough investigation, so that in case of the actual discovery of the San José scale the best methods of combating it may be put in operation promptly and its spread and increase be immediately checked. While the State Inspector alone has full power to enforce treatment of infested orchards or stock, the Entomologist of the Experiment Station will be glad always to examine and name specimens of scale-insects or other insects of any kind, and to furnish directions for avoiding or fighting any or all of our insect pests. Address all queries relating in any way to insects or their work to "Consulting Entomologist, Experiment Station, Agricultural College, Mich.," and be sure in sending specimens that the name and address of the sender are written plainly on the package containing the insects, so that no confusion may be possible when (as often happens) several packages of insects are received by the same mail.

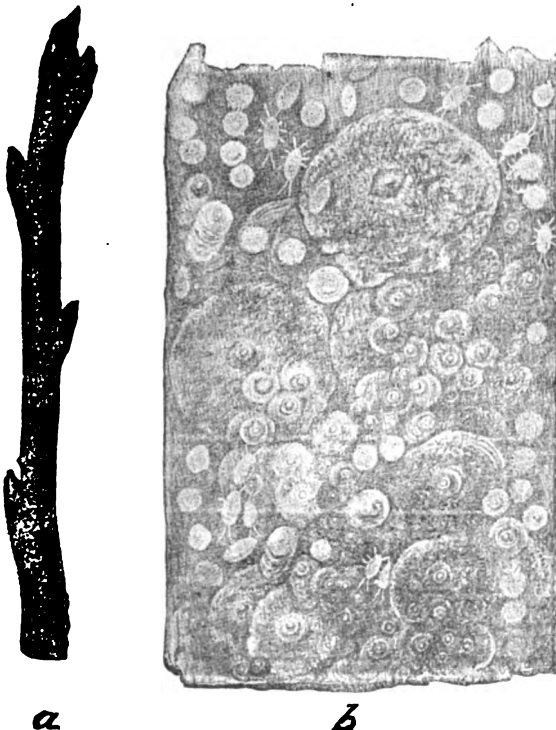


FIG. 7. San José Scale (*Aspidiotus perniciosus*); a, infested twig, natural size; b, bark as it appears under hand lens, showing scales in various stages of development, and young larvæ (after Howard, Bull. 8, New Series, Division of Entomology, United States Department of Agriculture).

The difficulty with which this species is detected is one of its worst features. The scales are so very inconspicuous that it is extremely difficult to find them before they have become so numerous that severe measures are required to check their increase and spread.

The appearance of this scale when in large numbers is that of a blackish grey scurfy deposit over the whole or any part of a tree (Fig. 7). When more closely examined, this covering is seen to be made up of myriads of small papery scales which can easily be detached by the thumb-nail, thus exposing the yellow or orange-colored bodies of the insects under them. These easily crush into an oily mass. The bark under and immediately around the scales is often stained wine-color, probably by some secretion or deposit of the insect. This, however, must not be taken as proof positive of the identity of the scale, for other scales closely resembling the one in question may produce the same effect. The individual scales are of two types, the scale of the female being several times larger than that of the male. The scale of the female (Fig. 8, 1) is nearly circular and flat, with the exuviae or cast skins

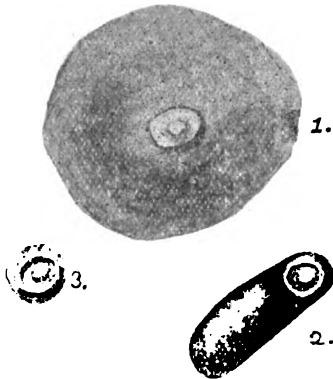


FIG. 8. San José Scale (*Aspidiotus perniciosus*).

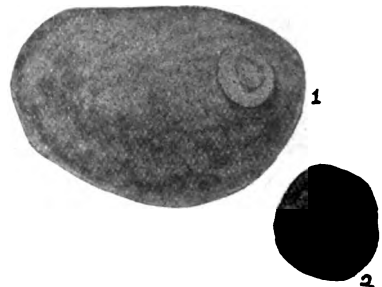


FIG. 9. Eccentric Scale (*Aspidiotus ancyllus*).

of the larva in the center. It is grey in color, while that of the exuviae varies from yellow to reddish-yellow or else is black. It measures one to two mm. (.04 to .08 inch). The scale of the male, on the other hand, is darker, usually almost black, and elongated (Fig. 8, 2). The cast skin is usually black and appears as a tiny nipple-like prominence. The male scale is about half as long as the diameter of the female scale.

These insects pass the winter in a partially-grown condition. At this time, before they become weatherbeaten and eroded, the scale shows a small central nipple surrounded by the slightly raised margin of the second larval skin, forming a minute elevated mound surrounded by a tiny ridge, the whole elevated and surrounded by the remainder of the scale, which varies in size according to the degree of maturity that it has attained.

As they are very small and dark in color at this time, the scales are naturally difficult to locate. This is readily understood if we remember that when a tree first becomes invaded there will be very few insects present, these only about the size of a small fly-speck and very likely placed under the base of a leaf. Only after they have become more or less

numerous can they be found at all easily. The number of plants on which they can thrive renders their extermination still more difficult. The following is a list of their food-plants taken from a treatise\* on this insect by Dr. L. O. Howard and C. L. Marlatt of the United States Department of Agriculture:

<i>Tiliaceæ</i>	<i>Saxifragaceæ</i>
Linden	Gooseberry
<i>Celastraceæ</i>	Currant
Euonymus	Flowering currant
<i>Rosaceæ</i>	<i>Ebenaceæ</i>
Almond	Persimmon
Peach	<i>Leguminosæ</i>
Plum	Acacia
Cherry	<i>Urticaceæ</i>
<i>Spiræa</i>	Elm
Raspberry	Osage orange
Rose	<i>Juglandaceæ</i>
Hawthorn	English walnut
Cotoneaster	Pecan
Pear	<i>Betulaceæ</i>
Apple	Alder
Quince	<i>Salicaceæ</i>
Flowering quince	Weeping-willow
	Laurel-leaved willow

We have found it on grape also.

#### REMEDIES.

Numerous experiments have proved conclusively that the remedies found to be effective on the Pacific coast are almost useless in the east, and this seems to be due to a difference of climatic conditions. All the experiments tried in the east seem to indicate that a wash of whale-oil soap used at the rate of two pounds of soap to a gallon of water, is the best and cheapest remedy. This must never be applied except when the trees are dormant, for its effect is very injurious if used when the foliage is on the tree. Two applications should be made, one in the autumn just after the leaves fall and one during the winter. Too much stress cannot be laid on doing the work thoroughly; every spot and every twig on the entire tree should be thoroughly wetted.

Whale-oil soap costs about four cents per pound if purchased direct from manufacturer and in quantity; the cost is then eight cents per gallon for the liquid ready to spray. If purchased in small quantities, the cost is considerably more. Strong potash solution has been used to some extent, but thus far it has seemed inferior to the soap, while its cost is considerably greater. Kerosene-emulsion is inadequate, while pure kerosene is pretty sure to kill the tree.

Before spraying, it is best to cut back all that the tree will stand and to *burn the cuttings*. If a small amount of stock is found infested, it should be rooted up and burned.

\*Bull. No. 3, New Series, 1896.

## THE ECCENTRIC SCALE.

(*Aspidiotus ancylus* Put.)

The nearest relative to the San José scale that we have in Michigan is the eccentric scale or Putnam's scale (*Aspidiotus ancylus*). Indeed, the resemblance is so close that it requires a careful examination to discriminate the two species. The scale of the adult female (Fig. 9, 1) is grey in color and nearly circular in form, though sometimes wider than long. The cast skins are almost always considerably to one side of the center or eccentric with the margin. The color of these cast skins or exuviae is usually brick-red, though they are ordinarily obscured by a secretion which is formed over them. The scale of the female is from one mm. to two mm. in size. The male scale (Fig. 9, 2) is smaller than that of the female and somewhat elongated, but otherwise resembles it.

The effect of large numbers of these scales cannot be otherwise than injurious, although trees seem to support a few without injury. The great range of food-plants on which the eccentric scale feeds makes it very difficult to eradicate. In this respect it is very like the San José scale. It is, however, an old stand-by; like the oyster-shell bark-louse, it has been here for a long time and is likely to be found on almost any apple, peach, plum or pear tree. It is also found on maple, hackberry, ash, and elm, besides a number of other trees and shrubs. Fortunately, although widespread, it is little to be feared, for it seldom becomes troublesome and then can be killed easily by the same methods employed against the San José scale.

The constant differences that distinguish the eccentric scale from the San José scale lie in the arrangement of the fringes on the last segment of the insect under the scale. These can be seen only with a compound microscope, and then the specimens require careful preparation. It is always best to resort to the compound microscope in settling these points, in order to be certain and to avoid the labor and expense which would follow the confounding these two species.

## THE OYSTER-SHELL BARK-LOUSE.

(*Mytilaspis pomorum*.)

Perhaps no other insect has been received by mail in greater numbers during the past season than the oyster-shell bark-louse (*Mytilaspis pomorum*). Although this scale without doubt has been a resident of Michigan almost from time immemorial, it has been brought to the front lately in unusual quantities because of its being mistaken for the San José scale. All scales look very much alike to the uninitiated and the oyster-shell scale is almost sure to be found wherever apple-trees exist. Fig. 10 will give an idea of the general appearance of the insect.

This scale, though everywhere present and sometimes very destructive, more often attacks trees that for some reason are unhealthy and which are therefore poorly fitted to support the extra drain of the scales. A strong, healthy tree can usually bear the presence of a few of these insects without much apparent injury, and they may be present for years in small numbers without multiplying sufficiently to do much injury. When, however, they become very numerous and seem to threaten the tree, they can be easily checked by a spray of whale-oil soap or potash, or by a spray of kerosene-emulsion when the newly-hatched lice are run-



FIG. 10. Oyster-shell Bark-louse (*Mytilaspis pomorum*).

ning about and before they have grown a covering for themselves. This time is usually during the last of May or the first of June,—the proper time can be exactly determined by closely watching the trees. Just as soon as the young lice are seen to be issuing from the scales it is time to spray. The young lice will appear as very small insects, about as small as can be seen by the unaided eye, and as they commence to secrete the scale almost immediately on coming out, the remedy must not be delayed. Use kerosene-emulsion, diluting about twelve times with water (Hubbard formula, or the same per cent of kerosene with any other formula). Another good practice is to scrape the scales from the limbs and then wash with kerosene-emulsion or strong soap solution.

#### WHITE SCALE OF THE PINE.

(*Chionuspinis pinifolii* Fitch.)

This pretty little scale is found on the leaves of almost all our species of pine and spruce. It is pure white except for the amber exuviae at the base. The adult female scales are usually long and slender and measure about three mm. ( $\frac{1}{8}$  inch). The males are somewhat smaller and possess only one cast-skin. While this scale does not often kill trees, it serves as a representative of the scale-insects, and is such a common species that anyone desirous of becoming acquainted with their appearance can readily obtain a supply.

#### SCURFY SCALE OF THE PEAR AND APPLE.

(*Chionaspis furfurus*.)

The scurfy-scale of the pear and apple can readily be distinguished from the other species likely to be found on the same hosts by its white color. It is from two to three mm. in size, and before it becomes corroded and soiled by the weather is snowy white except at the base, where the exuviae are placed.



While by no means to be compared with the San José scale in destructiveness, it sometimes becomes numerous enough on small trees to do serious injury. It readily succumbs to the caustic and soap washes used against most of the scales.

#### THE PLUM SCALE.

(*Lecanium cerasifex* Fitch.)

During the past year several specimens of a scale-insect on cultivated plum have been received. These are undoubtedly the New York plum-scale (*Lecanium cerasifex* Fitch), which has been the cause of a great deal of loss in the eastern states. The scales (Fig. 11) are brown, hemis-

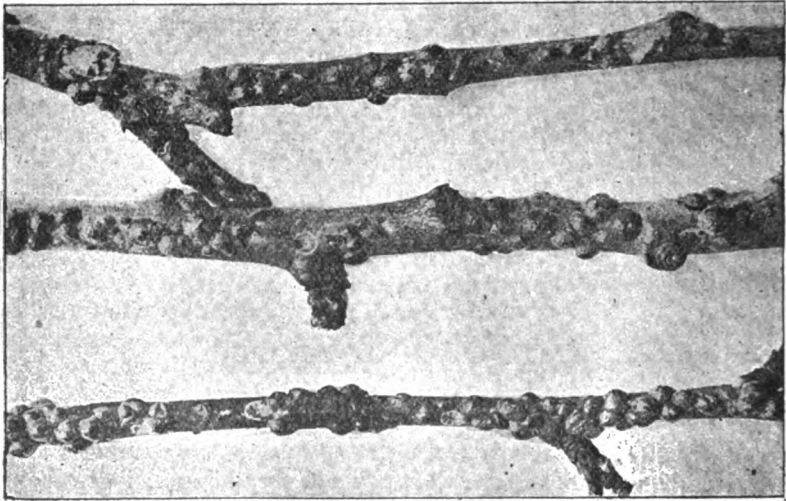


FIG. 11. Plum Scale (*Lecanium cerasifex*) (after Slingerland).

spherical bodies about one-eighth of an inch in length and with a dark brown, shiny surface, sometimes slightly wrinkled transversely. The longest diameter of the scale is usually placed lengthwise of the twig. During the early summer these scales are soft and easily crushed into a mass of pulpy flesh, but by the middle of June they become hard shells of a papery or horny texture and are then nearly full of eggs, which have been laid by the mother insect under her own body. The number of eggs under each scale is estimated at between one and two thousand. During July the tiny lice which emerge from the eggs make their way to the under side of the leaves, where they at once commence to suck the sap. Here they remain until late in August, when they migrate to the twigs, where they pass the winter. In this stage they are soft-bodied and less protected than at almost any other stage in their existence. Only one brood is hatched during the year.

The importance of applying remedial measures against this pest wherever it is found cannot be too strongly urged, for although it may remain for a long time without multiplying injuriously, it is liable, like the pear psylla, to become very troublesome when the conditions for its rapid increase become favorable. The fact that it is a conspicuous, stationary insect that has no power of flying away just when we want to treat it, is greatly in favor of the plum grower.

#### REMEDIES.

In New York state, where the pest has been most destructive, it is found that a spray of strong kerosene-emulsion will kill them. Prof. Slingerland says:\*

"Spray infested trees once after the leaves fall in the autumn, and at least twice in the spring before the buds open. Use kerosene-emulsion diluted four times (Hubbard formula), and the application cannot be done too thoroughly; each little scale must be hit."

#### CURRENT SCALE.

(*Lecanium ribesii* Fitch?)

On April 12 a branch of currant covered with soft, fleshy scales was sent us from near Port Huron. The specimens seem to agree very well with the meager description of *Lecanium ribesii* Fitch.†

They are yellowish-brown in color, mottled with brownish-black, and the entire surface is covered with dirty-white pustules. A prominent longitudinal ridge, amounting almost to a carina, runs down the center for half the length of the scale. The adult female measures from one-eighth to three-sixteenths of an inch in length and the breadth is usually about two-thirds of the length. Fig. 12 shows a group of the scales, greatly magnified, on a twig.

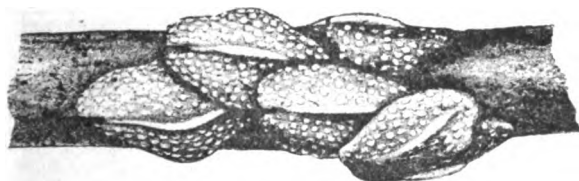


FIG. 12. Currant Scale (*Lecanium ribesii* Fitch) enlarged. (Original.)

While this scale has not done any great damage during the past season, the fact that it feeds on the currant and that it has been known to become destructive by reason of its rapid increase under favorable conditions, makes it of enough importance to bear careful watching. A thorough spraying with strong kerosene-emulsion during the early spring months will undoubtedly prove effective.

\*Bull. 108, Cornell Exp. Sta.

†"Third Rep. on Injurious Insects of New York, p. 109."

## THE CANKER-WORMS.

(*Anisopteryx pometaria* and *Paleacrita vernata*.)

Very destructive insects are the canker-worms. Though easy to conquer if properly treated, the annual loss due to their depredations in our State is very considerable. The past season has been no exception to the general rule, for the insect has been present in destructive numbers in various parts of the State. To judge from the letters inquiring for remedies against this old-time pest, it would seem that many persons have yet to learn the methods of fighting it.

There are two species of canker-worms more or less common wherever apples are raised; the fall canker-worm and the spring canker-worm. The fall worm (Figs. 14, 15) is perhaps the more common; it is a single-brooded insect, which lays its eggs either late in the autumn or early in spring. The egg hatches out a small loop-worm that grows to the length of nearly an inch. It varies greatly in color, but is usually grey or almost black, striped with yellowish or greenish. Being a measuring-worm, it has less than the ordinary number of legs, six true legs near the head and four false legs near the posterior extremity, with an extra rudimentary pair on the fifth abdominal segment. When full-grown it descends to the ground and usually buries itself, sometimes several inches beneath the surface. Here it forms a cell by turning round and round, and changes to the pupal stage. Late in the fall, from the last of October to the time when the ground becomes frozen, the adults emerge and lay their eggs on the branches of the trees. Many of the moths do not emerge in the fall, but remain in the ground till spring. When adult, the two sexes differ greatly in appearance. The male is a pretty moth with ash-grey front wings marked by three transverse darker lines, and hind wings of silvery grey (Fig. 14, *a*). The female, on the other hand, is not provided with wings, but has to crawl wherever she goes. She is somewhat more robust than the male and ash-grey in color, marked with black (Fig. 14, *b*).



FIG. 14. Fall Canker-worm (*Anisopteryx pometaria*); *a*, male; *b*, female; *c*, *d*, *e*, structural details.

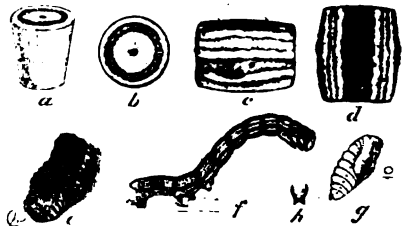


FIG. 15. Fall Canker-worm (*Anisopteryx pometaria*); *a*, *b*, egg, enlarged; *c*, patch of eggs; *c*, *d*, body segments of; *f*, larva; *g*, pupa of female.

The life-history of the spring canker-worm conforms in most important particulars to that of the one described, except that the adults do not

come out till spring. The loopers or span-worms of this species lack the pair of rudimentary legs on the fifth abdominal segment (Figs. 13, 16).

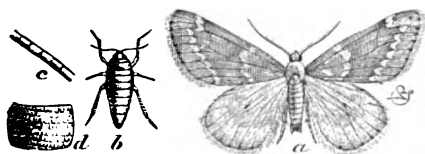


FIG. 13. Spring Canker-worm (*Paleacrita vernata*); a, male; b, female; c, d, structural details.



FIG. 16. Spring Canker-worm (*Paleacrita vernata*); b, an egg, much enlarged; c, d, body segments of larva.

#### REMEDIES.

The fact that the female canker-worms are wingless and must creep from the ground to the branches of the trees in order to lay their eggs, gives us an excellent means of fighting them. If we can head them off and prevent them from crawling up the trunks of the trees, the eggs cannot be deposited on the twigs and no harm will result. To accomplish this end various devices have been tried, such as banding the tree with paper and on this spreading printer's-ink or caterpillar-lime, or anything sticky enough to prevent the caterpillars from crawling up. Perhaps the best band is made of cotton-batting; a strip of this is wound around a tree trunk and fastened securely by a string at or below the middle. The upper end is now turned down, forming a loose, fluffy mass, in which the insects get entangled and die. This method has one disadvantage; the bands have to be kept on from the last of October until spring is well advanced, and must be renewed after rains, or when the cotton loses its fluffy nature. As the worms feed upon apple, elm, cherry and some other trees, precautions must be taken to prevent them from breeding on these trees and again infesting the fruit-trees.

The best method of overcoming these pests, however, is by spraying. They readily yield to a spray of one of the arsenites (see chapter on insecticides), which should be applied early, as soon as any worms are seen, even before blooming, but never during the period of bloom. It may be necessary to repeat the spraying, but this method is by far the cheapest and most satisfactory.

#### THE APPLE-LEAF TYER.

(*Teras minuta cinderella* Riley.)

In 1872, Dr. Riley described a small leaf-tyer (*Tortrix cinderella*)\* on the apple. Since that time, while it may have become injurious occasionally, it has never gained the name of a dangerous pest. The season of 1897 has witnessed an outbreak of this disease on the apples and pears in the southeastern part of the State.

The insect usually makes its presence known by folding together the upper surfaces of the leaves of the apple and pear along the midrib and then fastening them by means of silk. Inside this folded leaf the little worm lives and eventually passes its pupal stage preparatory to coming

forth as an adult. The larva or caterpillar is about one-half an inch long, yellowish-green in color, with the head and neck yellow and darker, the head marked with a crescent-shaped black spot. The pupa is about one-third of an inch long, brown, with a rounded knob-like projection in front of head. The adult is ash-grey in color, the front wings deeply colored and glossy, with a few reddish scales scattered over them sparingly and not giving the appearance of spots. The hind wings are of the same color but lighter, with a narrow fringe. The wings spread about one-half an inch.

Our attention was called to this insect by Prof. U. P. Hedrick, then State Inspector of Nurseries and Orchards, who sent us specimens and who kindly furnished us with the result of his observations. In the southeastern part of the State the leaves folded by this insect were numerous and the damage considerable, but as yet we have not heard of it from any other part of the State.

Several parasites are known to infest the leaf-tyer, and Prof. Hedrick assures us that he has seen flocks of blackbirds (probably the rusty grackle) feeding on the pupæ, neatly picking them out of their shelters and destroying them so completely that it was impossible to procure a good set of specimens.

When it becomes necessary to destroy these leaf-tyers, it can be accomplished by repeatedly spraying with Paris-green when the larvæ are very young. See chapter on insecticides.

### THE BUD-MOTH.

(*Tmetocera ocellana*.) -

Early in spring, just as they commence to swell and open, the buds of the apple, pear, plum, cherry, quince and peach-trees are sometimes attacked by a small, naked caterpillar about one-fifth of an inch long and dirty white in color. The head and thoracic shield are black or very dark brown. These caterpillars voraciously devour the opening buds and later feed on the tender leaves, binding several of them together at the end of a shoot. In this nest the caterpillar lives and feeds, after a time attaining half an inch in size. Specimens sent us from Bad Axe, Mich., and placed in breeding-cages, became full-grown about June 11. On June 15, they pupated inside the nest of leaves. On June 28, they commenced to emerge as ashy-grey winged moths, expanding about three-fifths of an inch from tip to tip of their wings. This delicate little moth (Fig. 17) is very prettily marked near the center of each fore-wing with a large, ill-defined creamy spot, while the base and tip of the wing are marked with black and dull blue. The hind-wings and the abdomen are grey. According to Professor Slingerland,\* the moths lay their eggs three or four days after emerging, usually on the under side of the leaves. They are described by him as transparent, flat,

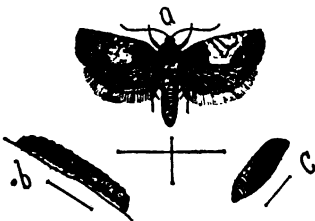


FIG. 17. Bud Moth (*Tmetocera ocellana*); a, moth; b, larva; c, pupa.

\*Bull. 50, Cornell University Ag. Exp. Sta., March, 1893, being a detailed history of the Bud-moth and its ravages

disk-like bodies, oval and very small. The egg stage is said to last from seven to ten days. The little caterpillars immediately commence to eat the outer covering of the leaves, usually on the under side, leaving the skeleton of veins untouched. The young larvæ spin a delicate tube of silk, in which they live. When they are grown to about one-fifth of an inch in length, they spin a tube in some protected place on the bark, and in this pass the winter. In the spring they come out and attack the bark as described.

#### REMEDIES.

The bud-moth may be destroyed most easily at the time when it first attacks the buds in spring. Prof. Slingerland says:\*

"Undoubtedly it can be checked somewhat by spraying in July, when the larvæ are at work on the under side of the leaves, but the time to combat the pest most profitably and successfully is in the spring when a little poison can easily be sprayed upon the opening buds; and thus the little larva, hungry from its long winter's fast, will be quite certain to get the fatal dose at its first meal."

This spraying should be repeated several times, as the period during which the insects can be reached is a short one; and they do not all come out together. The opening buds should be kept thoroughly poisoned, and the trees should be sprayed once or twice after the blossoms fall.

#### THE ARMY-WORM.

(*Leucania unipuncta*.)

The first recorded army-worm invasion in the United States took place in 1743, and from that time to the present we have been subject to greater or less loss from this source. During the past summer several complaints have been received from residents of the northern part of this State, and while the damage has not been so very serious to the State as a whole, it has caused some loss to individuals. The eggs of this well-known depredator are laid on the leaves and stems of grasses and grains. The young cut-worms that hatch from these eggs soon commence to cut off the leaves of their food-plants after the manner of other cut-worms, for the army-worm is really a cut-worm which has the habit of breeding in great numbers in a restricted area.

These little worms work mainly at night and during cloudy weather, and after cutting off a number of leaves and allowing them to wilt, they descend and eat, hiding during the day. After a time the leaves are all eaten and the hungry caterpillars are forced to attack the heads. It is at this time that the farmer usually first notices them. On looking into an infested field of oats or wheat before the tops are cut off all the stems are seen to be bare, making it possible to see for some distance into the grain, and if one kneels down and looks below the level of the heads the stems appear like a forest of minature fishpoles. As the worms usually appear by millions and all mature about the same time, the cut-

\*Bull. 107, Cornell University Ag. Exp. Sta., January, 1896

ting off of the heads usually occurs very rapidly, so that in two or three days large fields that apparently had been in fine condition are destitute of heads. Now commences the march that gives the name to the army-worm. As if moved by a common impulse, the hungry worms move off rapidly, usually all going in nearly the same direction. In this march they take almost anything that presents itself; many weeds, almost all grasses, many garden vegetables, corn, flax, etc., devastating the section through which they march much after the fashion of a small army. After a few days they become full-grown, if well fed, and pass into the ground, where they change to light-brown pupæ just beneath the surface, the insects remaining in the ground as pupæ for a time varying with the season and the brood. After a time, however, the pupæ split down the back and from each issues a moth, which after mating proceeds to lay a liberal supply of eggs for the next brood.

In our State there are probably three broods—one in April or May, one in July, and one in September. The second brood, however, is the only one that is to be feared ordinarily. The first or May brood consists of those that have succeeded in passing the winter successfully, and their progeny. It is usually a small brood, and while it may do considerable damage here and there, it seldom assumes the size and habit of marching characteristic of the army-worm at its worst. The second brood, which ordinarily appears in July in our State, is usually the destructive one, while the third brood rarely becomes troublesome. Although the majority of the insects develop with these large broods, a varying number are to be found in any stage at almost any time after the snow is gone until quite late in the fall. While the great majority of the September brood pass the winter as pupæ, a number progress still farther and hibernate as adults, while some of their eggs hatch, producing young caterpillars, which pass the winter in a partially grown condition. Thus we may find larvæ or caterpillars, pupæ, and adults all hibernating at the same time.

The egg of the army-worm is very small, rounded and nearly smooth. The caterpillar which comes from it, although the individuals vary greatly, is brown with longitudinal stripes running along the sides. In typical specimens, the under side is yellowish-gray and the back gray, mottled very finely with dark brown. The sides are marked with three stripes running the entire length of the body. The middle one is dark brown, while those above and below are light yellow with mottles of red and with creamy margins. The head is yellow, covered with characteristic dark brown or black mottlings. The legs are sixteen in number; six true legs near the head and ten false legs or pro-legs ranging from



FIG. 18a. Army-worm (*Leucania unipuncta*).

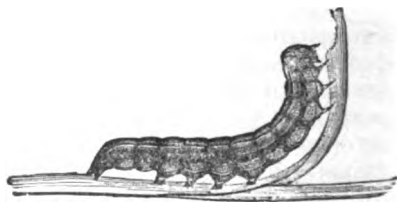


FIG. 18b Army worm (*Leucania unipuncta*)

the middle of the body to the posterior end. This caterpillar when full-grown (Fig. 18b) measures one and one-half inches in length. The worms

on attaining their full size transform to the pupal stage; to do this they either go just beneath the surface of the ground or secrete themselves under rubbish. The pupa is brown in color and about three-fourths of an inch in length.

The adult winged-moth (Fig. 18a), the parent of the caterpillars, is a clay-colored "miller" about an inch long, having at the center of each front-wing a distinct white spot. The veins and margins of the hind-wings are slightly darker and the front-wings are sprinkled with dark scales.

#### NATURAL ENEMIES.

Fortunately the army-worm has many insect enemies that feed on it. Several flies belonging to the Tachinidæ and some little, wasp-like insects belonging to the Hymenoptera. The good work done by these insects has much to do with keeping down the ravages of the army-worm. The tachina-flies lay little china-like eggs on the skin, usually near the neck, and these eggs hatch into grubs that burrow in through the skin and feed on the body of the living host. Whenever these eggs are seen to be plentiful, it is a pretty good sign that the worm will soon be in subjection again.

#### REMEDIES.

While it is difficult to apply any remedies that will save the field already infested, it is usually possible to prevent the migration into hitherto uninfested fields. To this end the entire infested area should be enclosed, either by barriers, ditches or furrows. The cheapest method and the one most quickly applied, is that of plowing furrows around the infested region. Four or five deep furrows should be plowed about six feet apart, turning the furrow toward the worms. The land side of the furrow should then be straightened with a shovel, and sometimes it is found advantageous to dig pits at intervals along the line, or better, to dig steep holes with a post-hole digger at intervals. The caterpillars in trying to march, will fall into the furrows, and in trying to climb up the steep side they will work along until they fall into the pits. Many will climb up the steep side of the furrow, but these will encounter the second ditch, and so on. When the first few ditches get well filled, they may be turned under by another furrow. As the worms work most in the night and during rainy weather, it is well to have several furrows where practicable, so that they will not require such constant watching. Sometimes the nature of the ground or of the surroundings renders it impossible to plow more than one furrow. In such a case a post may be attached to a rope and dragged along the furrow as the worms collect, crushing the worms and smoothing the furrow.

It is very difficult to say with any degree of certainty just when army-worms will become troublesome, but outbreaks are usually preceded by a wet spring, and two army-worm years seldom come in succession. It is well to watch the grain fields carefully, and whenever the leaves are seen to be disappearing and the little caterpillars are found to be plentiful, the field should be destroyed before the caterpillars are large enough to migrate.

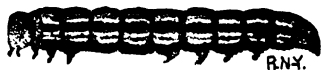
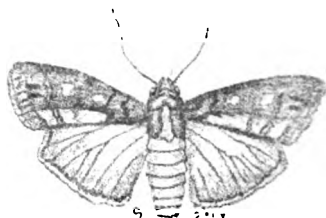


## THE ERRATIC ARMY-WORM.

*(Noctua fennica* Tausch.)

Every season or two, some insect long supposed to be harmless, and usually to be found at almost any time, will become a menace to farmers on account of changing its food-plant or by suddenly multiplying to unheard of numbers. The damage at such times may be considerable, but usually the insect quickly relapses to its normal condition and numbers, being held in check, perhaps, by adverse circumstances, or by parasites, until the proper combination of circumstances occurs again. The erratic army-worm has twice before become injurious under circumstances similar to those of 1897.

On May 21, a letter was received from Mr. W. S. Carpenter of Menominee, Mich., stating that the army-worms were eating his clover, and as he understood that army-worms did not ordinarily eat clover, he desired an explanation. The specimens sent a few days later were immediately recognized as the young of *Noctua fennica*. They were velvet-black in color, with a number of longitudinal yellowish lines and a brownish head (Fig. 19b). When full-grown they measure nearly one and one-half inches

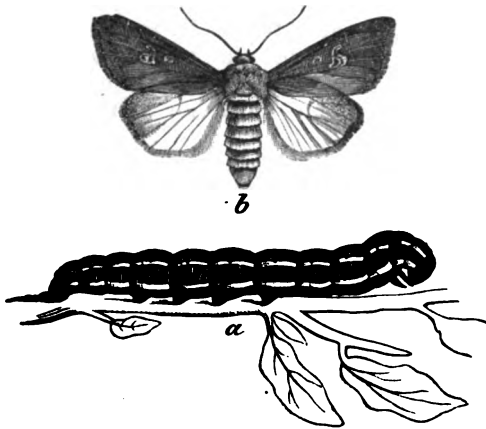
FIG. 19b. Erratic Army-worm (*Noctua fennica*).FIG. 19a. Erratic Army-worm (*Noctua fennica*).

in length. These insects did considerable damage in the vicinity of Menominee, eating almost everything and even gnawing the bark from young trees. The specimens sent us went into the ground and became pupæ on June 10. They should have emerged as moths in a few days, but they all died. The moth is shown in Fig. 19a. While this insect is not known to have the habit of marching in armies, it may be destroyed in the same manner as is the true army-worm.

## THE ZEBRA-CATERPILLAR.

*(Mamestra picta* Harr.)

On July 13. the farm of Mr. Banghart, near Lansing, was visited, and complaint was made at the time that worms were eating his sugar-beets. The caterpillar was *Mamestra picta* (Fig. 20), and the effect of its ravages among the sugar-beets was very apparent. This worm is about two inches long, light yellow in color, with three broad, black, longitudinal stripes running the entire length of the body, these stripes transversely veined with white. The moth (Fig. 20) has dark chestnut front-wings and

FIG. 20. Zebra-Caterpillar (*Mamestra picta*.)

lighter yellowish hind-wings. The winter is passed in the pupal stage.

## REMEDIES.

Fortunately, this worm can be destroyed by several methods, which can be varied to suit the requirements of any particular case. When the plants are young and there is no danger in the use of poisons, Paris-green may be used, either as a spray or mixed with flour or plaster. After the plants have become larger and there may be danger from the use of arsenites, then a spray of kerosene-emulsion or a dusting with hellebore or Pyrethrum will do nearly as well. Hand-picking is effective on a small scale.

## THE CAT AND DOG FLEA.

(Pulex serraticeps.)

There are several species of fleas that may infest houses and become troublesome. The species, however, usually found in this State is the common cat-flea or dog-flea (*Pulex serraticeps*). The eggs of these tormentors are laid in the hair or fur of the cat or dog and usually fall to the ground or floor. Here they hatch into slender white, worm-like larvæ, which grow for a time and then spin a tiny cocoon, in which they pass their pupal stage. From one of these cocoons the full-fledged flea emerges in a short time. Now a single small dog will sometimes scatter a most surprising number of eggs. Professor Verrill tells of collecting a full teaspoonful of these eggs from the dress of a lady in whose lap a kitten had been held for a short time. In rearing fleas, one can usually obtain a supply of eggs by shaking some rug on which an infested dog has lain. These eggs get into moist cracks in the floor and find here the best conditions for development, with the natural result that the house is soon overrun with fleas.

During August, last, one of the hotels in the central part of Michigan was suddenly overrun, in certain parts, with fleas. Specimens of these proved on examination to be the dog-flea, as was expected. We advised the free use of Pyrethrum or Persian insect-powder (see chapter on insecticides), both on the dog and on the floors of the rooms infested. This was applied with a bellows, and inside of a week no fleas were to be found, though the treatment was continued for some time. The source of infection must be removed by rubbing Pyrethrum into the fur or hair of the animal, while the fleas in the room can easily be destroyed by means of a simple insect-powder bellows.

## THE GRAPE CANE-BORER.

(Amphicerus bicaudatus Say.)

During the spring months the young shoots of grape-vines, as well as those of apple, pear, peach and plum-trees, are often found to be dying back for several inches from the tip. Occasionally this dead wood extends back for a foot or more. An examination of such twigs sometimes reveals a smooth, round burrow, extending several inches from the neat opening, which is usually placed in the axil of a bud (Fig. 22). This is

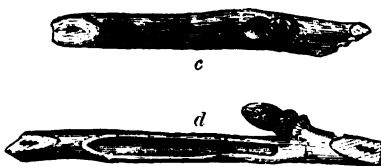
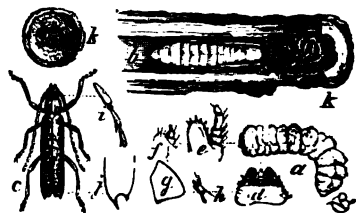


FIG. 22. Work of Grape-vine Cane-borer.

FIG. 21. Grape-vine Cane-borer, (*Amphicerus bicaudatus*).

the work of the apple-twigg borer or grape-cane borer (*Amphicerus bicaudatus*). On opening one of these burrows, it is sometimes possible to find the culprit, a slender, cylindrical beetle of dull brownish color (Fig. 21). The insects are always in the adult state when thus found, for their earlier stages are passed in quite different quarters. The damage done by these tunnelings is sometimes very serious, though what object the beetle can have in thus boring into the healthy growth is still a question; it is doubtless partly to obtain food. According to Mr. Marlatt,\* the insect breeds in decaying and diseased wood and in old canes and prunings. It also breeds in briars, producing one brood a year. Mr. Marlatt recommends the removal and destruction by fire of all prunings and decaying wood from the vicinity of the vineyard before midsummer. It would be well, also, to remove all briars from the vicinity. When the insects once get a start, nothing seems to stop them except hand-pruning of all infested shoots.

#### CHERRY-LEAF BEETLE.

(*Galerucella cavicollis* Lec.)

The red cherry-leaf beetle (Fig. 23) (*Galerucella cavicollis*) furnishes



FIG. 23. Cherry-leaf Beetle (*Galerucella cavicollis*). (Original.)

an excellent example of the change of habit or of food-plant sometimes adopted by insects. Up to a few years ago the species in question was believed to feed exclusively on wild cherry, with the exception of having been found once or twice on buttercup and chestnut, but quite recently it has taken a liking to our cultivated cherry-trees, and on account of this change of taste has become a troublesome and destructive pest.

In the Report of the Michigan Board of Agriculture for 1894, Mr. G. C. Davis mentions it as having been destructive to cherry-trees at Bellaire, Mich. It has lately become destructive in New York, and may soon be one of the regular enemies of the cherry.

The insect is thought to be one-brooded, and the beetles, which become troublesome in May and June, are probably those that have hibernated

\* Year Book Dep't of Ag. for 1895, p. 391.

or passed the winter in some protected place. These adult beetles lay eggs, which hatch and commence to be noticed in July as grubs feeding on the cherry leaves. They pass the pupal stage in the earth and become adults in September, remaining in this stage until the following spring.

#### REMEDIES.

The best remedy is a spray of Paris-green, applied as directed in the chapter on insecticides, but this must not be used after the fruit is well set and before it is picked. During this period it is necessary to use some contact poison, such as whale-oil soap or kerosene-emulsion, and the soap solution, used at the rate of one pound to five gallons of water, will probably prove the cheapest and best remedy, for at this time the insects are in the larval stage and no doubt will readily succumb to the spray.

#### THE ASPARAGUS BEETLE.

(*Crioceris asparagi* Linn.)

As long ago as 1856 the asparagus beetle is supposed to have been introduced into America from Europe. Its first appearance was at Astoria, N. Y., near New York city. Since that time it has spread through most of the eastern states. Michigan has been fortunate to escape the depredations of this insect up to the summer of 1896, when it appeared in Berrien county. The past season has brought several complaints of its presence and injuries from that district. This pretty little beetle lives both in the larval and in the adult stage on the asparagus, both wild and cultivated, and both young and old.

The elongated eggs, about one-tenth of an inch in length, are placed in short rows on the plant and hatch in about eight days. The soft, gray grubs (Fig. 24d) coming from these eggs immediately attack the succulent

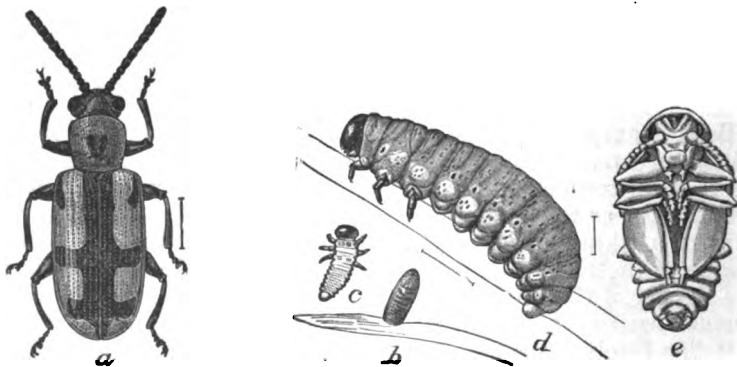


FIG. 24. Asparagus Beetle (*Crioceris asparagi*); a, adult beetle; d, larva, full-grown; c, young larva; b, egg; e, pupa, (Chittenden, Year-book of Dept. of Agriculture for 1896.)

leaves or stems and continue to feed for about two weeks, after which they go into the ground and become pupæ. Here they remain for about

eight days and then emerge as adult beetles. The entire time required from the laying of the egg to the appearance of the adult is about a month. The winter is passed by the adult under rubbish, loose bark, etc. The adult beetle (Fig. 24a) is about one-quarter of an inch in length, the wing-covers are reddish-yellow and cream color marked with black. The head is black and the thorax reddish-yellow. The larvæ are grayish with a black head. To our knowledge it has appeared thus far in Berrien county only, but it may be expected, in the course of a few seasons, to extend its range to the entire southern portion of the State.

#### REMEDIES.

While the asparagus beetle, if allowed to have its way, will put a serious impediment in the way of asparagus growing, it is easily held in check by a careful and conscientious use of the measures recommended.

Seedlings and old plants not at the time being used for the table or market should be sprayed with Paris-green. This will dispose of both the beetles and grubs on them if repeated from time to time. The fields which are being regularly cut for use should not be sprayed on any account, because of the danger to human life, but a practice should be made of always leaving some young shoots for the beetles to lay their eggs upon, and these shoots should be cut and burned before they are a week old to destroy the eggs, which otherwise would hatch at the end of eight days. If such patches be systematically left all over the field and carefully cut and burned at the proper time, early in the season, the beetles will be found to decrease in number as the season advances. As soon as the cutting season is over the whole field should be sprayed from time to time with Paris-green and all rubbish about the field should be burned late in the fall.

Air-slaked lime will kill many grubs if dusted on them, as will also Pyrethrum. Kerosene-emulsion also will kill them, but the methods first named have thus far proved the most effective.

#### THE PEAR SLUG.

(*Eriocampa cerasi*.)

The family of saw-flies takes its name from a saw-like appendage or ovipositor with which the female plows or gouges out a pocket or furrow in which to place the eggs. They are not true flies at all, but the adults are somewhat wasp-like in appearance. The larvæ of most saw-flies are soft and somewhat sticky "worms or slugs," and many of them are quite injurious to vegetation.

The larva of the pear-slug or cherry-slug (Fig. 25) is a shiny, dark-green



FIG. 25. Pear Slug (*Eriocampa cerasi*).

worm about half an inch long. It works on the leaves of the pear and cherry, scraping off the soft part in patches, but leaving the veins. Sometimes when very numerous, as they were during the past summer in the western part of the State, they do a great deal of damage.

#### REMEDIES.

The sticky, viscous nature of these worms gives us an excellent means of fighting them. Any dry powder which is caustic and which will not injure foliage, such as air-slaked or dry-slaked lime, will stick to the skin and eventually kill them. Hellebore is perhaps the best remedy of this nature; it should be diluted three times with flour, but, unfortunately, Hellebore is expensive and for this reason it is often better, if the orchards are large ones, to spray with Paris-green, using one pound of the poison to 150 or 200 gallons of water, always adding lime. (See chapter on insecticides.)

Sometimes the worms come on after cherries are pretty well grown, and in this case Paris-green or any arsenical poison should not be used, because of its poisonous properties, but a spray of kerosene-emulsion (Hubbard's formula), diluting ten times with soft water. Whale-oil soap is recommended as being very effective, using twelve pounds of the soap to fifty gallons of water.

#### THE WHITE-PINE SAW-FLY.

(*Lophyrus lecontei* Fitch.)

About July 13 the white pines on the campus were seen to have colonies of small, naked caterpillars scattered through their branches. None of the colonies were large and the injury to the trees was very slight. Nothing more was noticed until near the middle of September, when these little false-caterpillars again appeared. This time, however, their work was not limited to the defoliation of a few branches, but the work of destruction continued until the middle of October, and occasional specimens were to be seen even in November. The trees were sprayed where this could be done easily, but the damage was very considerable in spite of everything. Large trees lost a third of their foliage, and it seems no exaggeration to say that the worms could be measured by the bushel.

These little false-caterpillars (Fig. 26) are the larvæ of saw-flies. They



FIG. 26. White-pine Saw-fly (*Lophyrus lecontei*); larva.

are yellowish or greenish-white in color, and when full-grown measure three-quarters of an inch in length. They are provided with twenty-two legs. The head is jet black, as are also four rows of spots which run the entire length of the body. Two rows of elongated spots run down the back, while on each side is a row of broader squarish spots. There is a great

deal of variation both in the size and shape of these markings. In the younger stages, some of the caterpillars are marked like the adults, while others are unspotted. The worms feed in colonies or bunches, each bunch occupying part of a limb and stripping it of leaves. It is a curious fact that the worms of a single colony are usually marked very much alike, being probably the offspring of a single parent, while different colonies exhibit a good deal of variation.

After the worms attained full size they descended to the ground and spun very pretty cylindrical cocoons with rounded ends. In color these cocoons varied from white to bronzed-brown, and in size from one-quarter to three-eighths of an inch in length. They are usually buried in the fallen needles or in the grass under the tree. Fortunately, the great majority of these cocoons are placed directly under the tree, although a certain proportion of the larvæ travel some distance before spinning. When placed in breeding-cages and kept in a warm room, the adult saw-flies (Fig. 27) commenced to emerge about November 8, and continued to



FIG. 27. White-pine Saw-fly (*Lophyrus lecontei*); adult insect. (Original.)

come out for over two weeks. Under natural conditions they remain in the cocoon until spring, and then come out in great numbers.

Some accounts of this insect describe the cocoons as attached to the leaves of the pine. Specimens of cocoons thus placed were received from Centreville, Mich., and these, as well as the accompanying larvæ, were indistinguishable from the cocoons and larvæ found here.

This saw-fly usually has been considered as one-brooded, but its behavior in this instance would seem to indicate that it is double-brooded and that the July larvæ furnished the saw-flies that laid the eggs for the more numerous fall brood.

Fortunately, these worms are usually kept in check by parasites, but when for some unknown cause the balance of life is disturbed and the parasites suddenly decrease in number, we may expect a sudden appearance of the pest and be driven to artificial means for the protection of our parks and shade trees.



## REMEDIES.

The drawback in fighting these insects arises from the difficulty of applying remedies in the inaccessible places that they inhabit. In places where shade-trees are affected, it is usually possible to apply sprays. The larvæ readily succumb to a spray of Paris-green or kerosene-emulsion. While the former is cheaper, the latter is preferable where for any reason it is unsafe to apply poisons. The great height of pine-trees often makes it impossible to reach the top with a spray; in such cases hellebore should be applied. Mix one part of white hellebore with three parts of flour and tie up a pound or so in a piece of coarse cheese-cloth or in four or five thicknesses of mosquito-netting. This should be tied to a long pole and taken up into the tree on a still day. By going above the infested part and beating the pole with another stick the powder will be sifted out and will settle on the worms. It is best to do this on a quiet morning when the dew is on the trees. The hellebore will act in two ways, some will stick to the moist bodies of the worms and some will settle on the leaves and be eaten, in either case the worm will be destroyed. If a dust-gun is to be had, this may be used more quickly and effectively, but in most cases the injury is well advanced before it is noticed, and if the trees are to be protected there is no time to procure such apparatus. In November all the fallen needles and debris should be raked from beneath the affected trees for some distance around, and burned to destroy the cocoons.

## FORMULAS AND DIRECTIONS FOR USE OF INSECTICIDES.

To be of much service, spraying must be thoroughly done. A conscientious and thorough spraying will wet every part of every limb, twig and leaf on both sides. To accomplish this result cheaply and surely, a spray as fine and mist-like as possible must be used. When a poor nozzle is used, one that projects a coarse spray composed of distinct drops of liquid, much is sure to fall to the ground and be lost. Good nozzles save enough insecticide to pay for themselves in a short time. When contact insecticides, such as kerosene-emulsion or whale-oil soap, are used, each insect must be fairly hit with the liquid to be killed.

Insects that chew or bite their food are usually most cheaply and effectually killed with arsenites, such as Paris-green, while those that suck their food from beneath the surface of the plant have to be killed by contact insecticides, such as kerosene-emulsion, whale-oil soap, etc. In some cases insects that chew have to be killed with contact insecticides; for instance, when they are on fruits or vegetables nearly mature or on which it would be dangerous to use Paris-green because of its poisonous properties.

The pump should be strong and well made, of sufficient capacity to throw the one or two sprays required without too great exertion. An attempt to spray a large orchard with a pump designed to use on small garden plants is discouraging, to say the least.

When large, high trees are to be sprayed, it is often found best to build an elevated stage on top of the wagon-tank or over the barrel containing the liquid. To reach the top of the tree, it is usually best to fasten the nozzle to the tip of a strong bamboo or to attach it to a length

of half-inch gas-pipe and send the stream of liquid through the gas-pipe. At least fifteen feet of hose should be allowed in order to reach all parts of the tree.

Never spray a tree when in bloom, it may kill bees, both wild and hive-bees.

Stone fruits require especially careful treatment; they are easily injured by sprays not properly mixed or prepared.

#### INTERNAL POISONS FOR INSECTS THAT CHEW.

##### PARIS-GREEN.

At the head of all the stomach-poisons stands Paris-green or arsenite of copper. To prepare Paris-green for spraying, slake one pound of well-burned quick-lime in hot water and stir in one pound of Paris-green. Allow this mixture to stand over night, strain, and then stir it into from 150 to 250 gallons of water. Keep the liquid well stirred while spraying. For most insects, one pound to 200 gallons of water is sufficient, and at this rate it will not injure the plant. Stone fruits, such as peach, plum and cherry, should not receive a spray much stronger than this, but apples, pears, etc., may be sprayed with a mixture considerably stronger, viz.: one pound to 150 gallons of water. Potatoes may be sprayed with one pound to 100 gallons of water. Paris-green is fairly uniform in composition if not adulterated, and is perhaps the safest and surest remedy for chewing insects as a whole.

##### LONDON-PURPLE.

Next to Paris-green comes London-purple, which is used in the same way, except that twice as much lime should be mixed with it. Its effect is a good deal the same, though it is far more variable in composition and more likely to burn the foliage; it should never be used without lime.

##### DRY METHOD.

While ordinarily it is most economical to use Paris-green in the form of a spray, in some instances, where only a few plants are to be treated or where no pump is available, it is expedient to use it as a dry powder. It should then be mixed at the rate of one pound of the poison to 100 pounds of plaster, flour, or air-slaked lime, and dusted on the plants through a sack of burlaps or some loose, coarse cloth. It is best to make the application in the morning when the dew is on the plants. Never apply dry poisons where the wind can blow the powder into pastures or places where cattle or horses are feeding.

##### ARSENITE OF LEAD

This poison, although not in general use throughout the country, has several advantages; it shows where it has been applied; it is light and does not require such vigorous stirring as Paris-green; it does not easily

burn the foliage, and it is cheap. To prepare it, dissolve four ounces of arsenate of soda and eleven ounces of acetate of lead, each in a gallon of water. On mixing the two solutions together we shall get a milky precipitate, which should be stirred into 100 gallons of water. It is now ready for spraying. Of course, larger or smaller quantities may be made in the same proportion, and if this preparation does not seem strong enough, it may be applied much stronger with safety.

Its action is slower than that of Paris-green, but the fact that it does not readily burn foliage is an advantage when spraying various kinds of trees with one mixture.

#### CONTACT INSECTICIDES, FOR INSECTS WHICH SUCK THEIR FOOD.

The most effective contact insecticides are kerosene-emulsion and whale-oil soap. Kerosene-emulsion may be used against all lice (except bark-lice), bugs, etc., which do not succumb to the internal poisons. To be effective it must be very carefully made and conscientiously applied.

Place two gallons of ordinary kerosene in a warm place, either in a warm room or in the sun, and allow it to become as warm as possible without danger from fire. Boil one pound of laundry soap or whale-oil soap in a gallon of soft water until completely dissolved. If the water is the least bit hard, "break" it with washing soda. Remove the soap solution from the fire, and while still boiling hot add the kerosene and agitate for ten minutes, or until the oil is emulsified, with a spraying-pump by forcing the liquid back into the vessel from which it was pumped.

When the liquid is perfectly emulsified it will appear creamy in color and will flow evenly down the side of the vessel. Care should be taken to completely emulsify the oil, and this is accomplished much more easily when the mixture is hot. This strong emulsion may now be readily diluted with water and used, or it may be stored away for future use. When cold it becomes like sour milk in appearance, and should be dissolved in three or four times its bulk of hot water before diluting with cold water.

Small amounts of this emulsion may be made by using the ingredients in small quantities, but in the same relative proportion.

It should be diluted ten times for most insects, but many plants are able to resist a stronger mixture, which is usually more effective.

#### WHALE OIL SOAP.

This insecticide is rapidly coming into favor. It may be used at the rate of one pound to from four to six gallons of water for plant-lice and many other insects. For winter spraying it is used at the rate of two pounds to a gallon of water. This is the most effective remedy known against the San José scale.

Whale-oil soap should cost about four cents per pound when bought in quantity. It requires no preparation other than dissolving in water, and ordinarily is easily applied. Care should be observed to get an

article that will not turn to a jelly when dissolved at this rate, for jellied soap is very difficult to spray. The above strength, two pounds to a gallon, should never be applied except in the winter when the trees are entirely dormant, for an application when the buds are swelling or when the leaves are on the tree is sure to do great injury to the tree.

#### PYRETHRUM.

(Buhach or Persian Insect Powder.)

Pyrethrum is a powder made by grinding the heads of a plant resembling our daisy. It is produced in great quantities in California, where it is sold under the proprietary name of "Buhach." It is also imported from Persia and known as "Persian insect-powder." Now, the insecticidal value of the Pyrethrum lies in an oil which readily passes off into the air, and to prevent the loss of this the powder should always be kept tightly sealed in metal cans. Insect-powder that has been exposed for sale in open cans in drug-store windows is next to worthless, and should on no account be purchased. This insect-powder is harmless to all animals breathing by means of lungs. It can be used either dry or in the form of an alcoholic extract. To apply it dry, dust the powder on the insects either by means of a bellows or in some other way. To apply in the form of an extract, place four ounces of the powder in a pint of alcohol, leave it for a week and filter, then dilute once with water, and apply with an atomizer.

#### HELLEBORE.

White hellebore is the powdered root of a plant. It kills both by contact and as an internal poison. It may be applied either dry or in the form of a liquid. When used dry it should be mixed with three or four times its weight of flour or plaster and then dusted on the insects. Applied wet, one pound should be mixed with twenty-five gallons of water and this liquid applied as a spray. A convenient form of duster is made as follows: A tin box like a pepper-box, holding a quart or less, is fastened to a stick about six feet long by means of a screw running through the bottom of the box into the stick. The cover of this box should be finely perforated to allow the poison to come out very slowly when shaken. This box can then be shaken over the infested plants and the insects peppered or dusted with the poison.

Hellebore is especially useful against all moist-bodied insects, such as currant-worms, pear and cherry-slugs, etc., for the poison sticks to their bodies.

#### THE GASOLINE BLAST.

During the season of 1897, an apparatus was devised for burning scale insects on the tree. An ordinary gasoline blast-lamp or soldering torch such as is used by plumbers was fitted with five parallel burners so arranged that a broad sheet of flame about ten inches wide could be directed on the tree. A torch of this sort was made for the writer in the fall of 1897 and during the winter several tests were made.

When the flame is passed over the body of a scale-coated tree, the scales instantly change color and many drop off. If rubbed the scale is seen to be loosened and on examination with a lens shows minute lines resembling cracks running in all directions over the surface. Now the trunk and larger limbs of trees are often covered several layers deep with the scales and in such cases this method of treatment seems useful. It destroys most of the insects and so loosens the mass that it is possible afterwards to penetrate to the bottom with a spray. The heat produced by this lamp is very intense and great care must be observed not to allow the flame to remain at any one point long enough to injure the tree. In the experiments tried, the best results were obtained when the flame was steadily moved so that it covered a space of a yard in length in from five to ten seconds. The trials were made on peach and pear trees badly affected with the San José scale, and during the winter months while the trees were dormant. The results seemed to show that the blast will kill the scale-insects with little or no injury to the tree; the trees were scorched in places where the flame had moved too slowly and the care necessary to avoid the scorching appears to be the most serious drawback to the use of the blast-lamp. In careless hands much injury may be done in a very short time while the skilful handling necessary for success would be rather expensive under ordinary circumstances. Good judgment must be exercised always and the rapidity and effectiveness of the work will be much modified by the temperature of the air, the direction and force of the wind, the age of the tree and the thickness of the encrusting scales. Under favorable conditions we believe the blast-lamp can be used to good purpose and economically in destroying scale-insects, but we are not prepared to recommend it for general use as superior or even equal to treatment by spraying.

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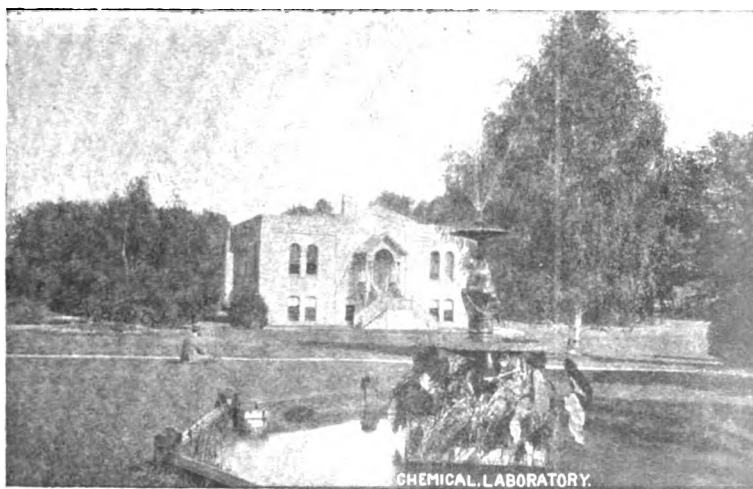
**BULLETIN 161.**

MICHIGAN

STATE AGRICULTURAL COLLEGE

# EXPERIMENT STATION

CHEMICAL DEPARTMENT



## FERTILIZER ANALYSE

---

BY R. C. KEDZIE

CHEMIST OF THE EXPERIMENT STATION

---

AGRICULTURAL COLLEGE, MICHIGAN  
1898



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FERTILIZER ANALYSES

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1898



*The Bulletins of this Station are sent free to all newspapers in the State and to such individuals interested in farming as may request them. Address all applications to the Secretary, Agricultural College, Michigan.*

# MICHIGAN AGRICULTURAL EXPERIMENT STATION

Postoffice and Telegraph Address, . . . . . Agricultural College, Mich.  
 Railroad and Express Address, . . . . . Lansing, Mich.

A DEPARTMENT OF THE STATE AGRICULTURAL COLLEGE, AND, WITH IT, CONTROLLED BY THE

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### SUB-STATIONS

Grayling, Crawford County, 80 acres deeded.  
 South Haven, Van Buren County, 10 acres rented; 5 acres deeded.

## FERTILIZER BULLETIN.

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Act No. 26 of the session laws of 1885 provides for the inspection, analysis and licensing of commercial fertilizers sold or offered for sale in this State, under the direction of the State Board of Agriculture. The law has been printed in full in the Fertilizer Bulletins in years past, and it is not necessary to reprint it now. A summary of its provisions is given instead of the full text.

1. Any person selling a commercial fertilizer, the retail price of which exceeds \$10, must stamp each package with the trade name, number of pounds and the percentage of nitrogen, phosphoric acid and potash.

2. Before offering such fertilizer for sale, a certificate of its analysis and a specimen of such fertilizer must be deposited with the Secretary of the Board, with a fee of \$20 for each brand of fertilizer, on or before the first day of May. If the manufacturer fulfills all the conditions of this section for any given brand of fertilizer, his agent for such fertilizer is not required to take out a license; otherwise each agent must take out a license, or be liable to the penalty.

3. The penalty for violating this law is a fine of not less than \$100 for the first offense and \$300 for every subsequent offense.

The law is very plain, and it would seem that no one need misunderstand it. Yet a few points need to be emphasized. The sample of fertilizer, certificate of analysis and fee for license must be deposited with the Secretary on or before the first day of May each year. If the manufacturer neglects or refuses to take out a license, each dealer must take out a license to avoid the penalty. It would be wise for the retailer to refuse to handle the fertilizers of any manufacturer who does not protect his agents by promptly complying with the law. The agent would regard it as a hardship to pay \$100 fine because of the neglect of his principal.

### OBJECT OF THE LAW.

It is the aim of this law to protect two classes: the farmer in buying fertilizers, and the manufacturer in selling his products. By publishing the real nature of the fertilizer as shown by analysis of the material found in the open market the intelligent farmer can make some estimate of the value and know the amount of desirable materials in the fertilizer, and thus be protected from fraud. The honest manufacturer is protected by the same means from the competition of dishonest competitors, who would undersell him by means of worthless goods. The results of analysis are published only of the goods of such dealers as have complied with the law and are willing to let the public know the real quality of their fertilizers. If such goods are offered for sale in this State which do not appear in this Bulletin, the prudent farmer will do well to avoid such fertilizers.

W I S C O N S I N

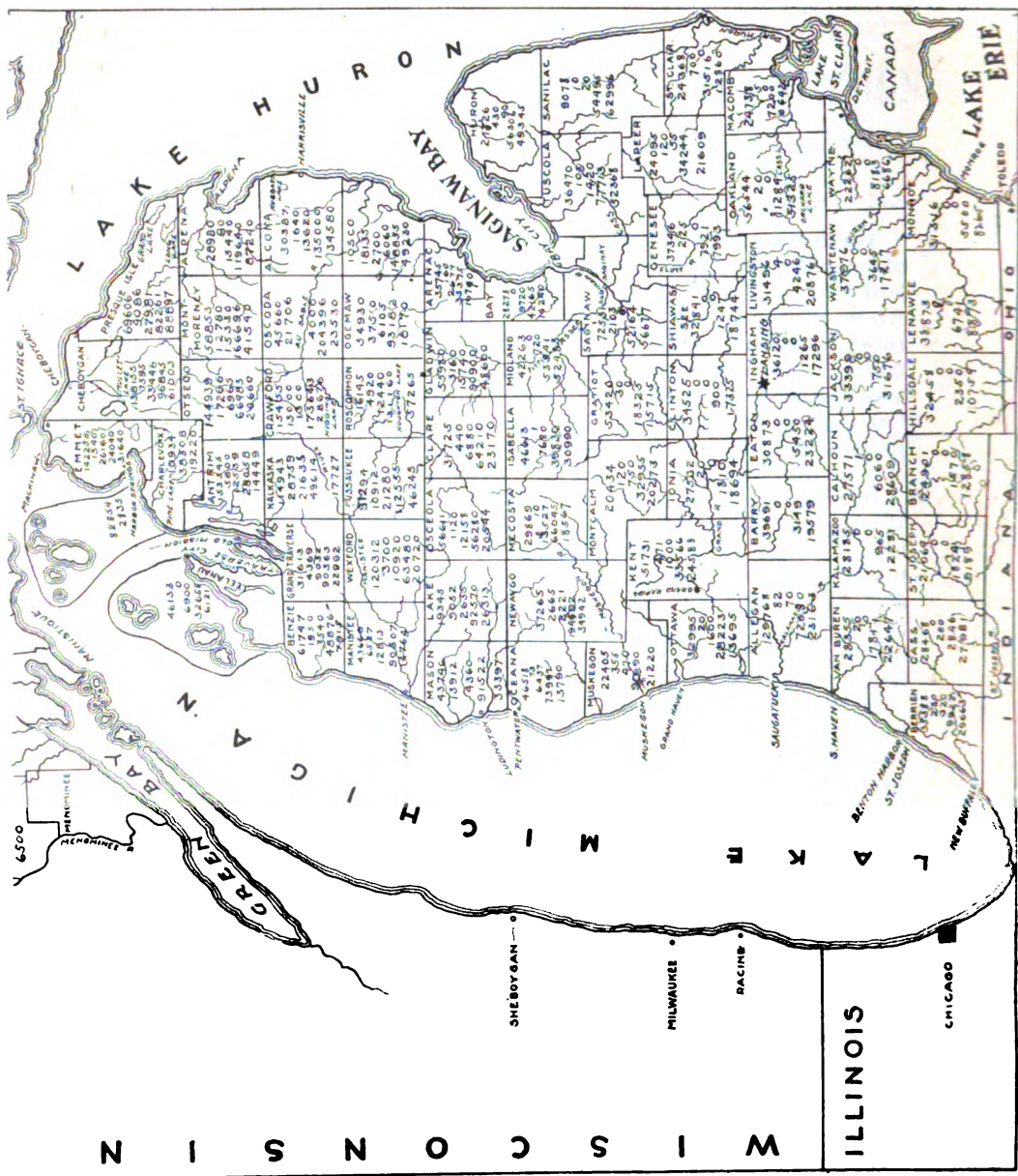
ILLINOIS

CHICAGO

RACINE

MILWAUKEE

SHEBOYGAN



## A SKETCH OF THE ORIGINAL DISTRIBUTION OF WHITE PINE IN THE LOWER PENINSULA OF MICHIGAN.

C. F. WHEELER.

In the lower peninsula of Michigan, the white pine (*Pinus strobus*) was originally found scattered throughout the part of the state north of the 43rd parallel of north latitude. The actual southern limit of lumbering operations, that is, where the pines grew in numbers sufficient to be lumbered, is shown in the accompanying map, on page 6, by a dark line extending across the state, from Port Huron on the east to Covert, in Van Buren county, on the west. South of this line were a few straggling white pines in Oakland, Shiawassee, Livingston and Ingham counties, while along the Lake Michigan shore they were found southward to the Indiana line. The actual distribution of the white pine in this extensive region was due, to a large extent, to the quality and condition of the surface soil. This most valuable tree delights in sandy ridges in the neighborhood of streams, rivers and lakes and seldom grows in large, solid tracts away from these water courses. Where gravels and clays and various mixtures of these soils are found, numerous broad leaved trees struggled for supremacy forming tracts of mixed hardwood and pine forest.

In the counties of Bay, Arenac, Presque Isle, Cheboygan, Otsego, Antrim, Kalkaska and all of Leelenau were found fine forests of hardwood containing more or less white pine intermixed. In the counties of Iosco, Oscoda, Crawford, Roscommon, Missaukee, Clare, Grand Traverse, Lake, Mason and Newaygo, occurred the so-called "barrens" or "plains," where the soil is sterile and more or less covered with Jack pines (*Pinus divaricata*) and little white pine is to be found.

The largest and best pines were scattered among hardwood trees, towering above them, relics, probably, of the time before the hardwood existed.

The geological conditions of the great northern lobe of the lower peninsula, north of the Grand-Saginaw valleys, due to the large extent of the very friable Marshall sandstone found there, furnish the sands and gravels that the pine tree delights in. The rainfall of this region, combined with evaporation from the surrounding great lakes was the chief remaining factor in the problem of the original distribution of white pine in Michigan.

Estimates of the total amount of white pine growing in our state have been made at various times. In 1835 the standing white pine was put down as one hundred and fifty billion feet, an estimate probably much too low. The census report for 1880 puts the amount of merchantable timber (white pine) remaining in the lower peninsula at twenty-nine billion feet. The total cut for that census year was estimated at a little over four and one-half billion feet.

The latest estimates of the amount of standing white pine remaining in Michigan were made in the year 1896-97 by Hon. Chas. H. Morse, the State Commissioner of Labor. These estimates appear in the 14th annual report of the Bureau of Labor Statistics. Schedules were sent to supervisors of townships and from the returns received the figures on the accompanying map are compiled. It was shown that there were approximately 775,208 acres of white pine still standing in the forests of Michigan at that date. The distribution of the pine, hardwood, "Jack pine plains," and swamp lands is shown on the map. The first set of figures in each county denotes the acres of hardwood in that county; the next set of figures the acres of pine; the third the acres of hemlock; the fourth the acres of "plains" land, and fifth the acres of swamp land.

C. F. WHEELER  
Consulting Botanist.

# MAP SHOWING ACREAGE OF STATE LANDS IN LOWER PENINSULA OF

AC. AGR'L COLLEGE LANDS

PS. PRIMARY SCHOOL

S. STATE SWAMP

A. ASYLUM

U. UNIVERSITY

SS. SALT SPRING

TH. TAX HOMESTEAD

T. STATE TAX

Note: - T denotes number of descriptions of land held by the State for delinquent Taxes; the descriptions vary from 1/4 mile to an entire Section, in area.





PRESENT CONDITION OF MICHIGAN FORESTS AND STUMP LANDS  
WITH SUGGESTIONS AS TO THEIR CARE.

F. E. SKEELS.

The map upon the opposite page is intended to convey some idea of the class, location and area of the lands of the lower peninsula of Michigan, which might be available for forestry purposes. These are classed as Tax Homestead, State Tax, Agricultural College and Primary School lands. The Tax Homestead lands are those which have for the most part been stripped of the original timber and forfeited back to the state for non-payment of taxes by the lumber men who had no use for the land, and in most instances would, under favorable conditions, produce another forest. These lands have been deeded by the Auditor General to the State of Michigan and are now under the control of the Commissioner of the State Land Office and can be located by bona fide residents for ten cents per acre. The State Tax lands have become the property of the state for the non-payment of taxes, and if not redeemed by the original owners, or by some speculator who sees enough timber upon certain tracts to warrant the payment of back taxes, will in time become Tax Homestead lands. The figures upon the map at the letter T denote the number of descriptions in each county, held by the state, as tax lands and although the descriptions vary in area from the village lot to entire sections of land it is safe to estimate that in the northern counties each description will mean at least 80 acres. The Agricultural College and Primary School lands are lands from which no timber has been removed and are for the most part too valuable for farming purposes to be used as forestry reserves, especially as there is so much other available territory which seemingly is not wanted for any other purpose.

A glance at the map will suffice to show that nearly all of our northern river systems have their source or sources in an area which has an abundance of Tax Homestead and State Tax lands. Thus the Muskegon river rises in Roscommon and Missaukee counties. The Manistee and Au Sable rivers, although the former discharges its waters into Lake Michigan on the west side of the state and the latter into Lake Huron on the east side, rise in Crawford and Otsego counties and the source of the one is but a mile or two from that of the other. The Sturgeon, Pigeon, Black and Thunder Bay rivers rise in this same locality and in these counties and those through which these streams flow we find the greater portion of these available forestry lands.

Thus in Missaukee we have 12,385 acres of Tax Homestead, and an estimated area of 113,000 acres of State Tax land, or in round numbers 125,000 acres or over five entire townships. In Roscommon county we have an aggregate of about 250,000 acres or over ten townships in these two classes of abandoned lands.

Crawford county has 185,000 acres. Otsego has 90,000 acres. Montmorency 240,000 acres, Oscoda, Ogemaw, Alcona and Iosco each over 250,000 acres; Alpena and Presque Isle nearly 300,000 acres each. This entire territory is abundantly watered with beautiful lakes and streams abound-

ing in trout, grayling and other fish that attest to the purity of the water, and the deer and other wild animals of the lower peninsula are almost entirely confined to this locality.

This region then, because of its area, water and excellent topography, is the place upon which to rear up a new forest and in fact there is no other location in the lower peninsula where the state can control an area of land sufficient in extent for that purpose.

The present condition of the original forests of Michigan is the same as that of any other property that has passed into the hands of an owner, who sees in it only the dollars and cents which the article will return when put upon the market. Fully ninety per cent of all the wooded lands in our state are owned by parties who will convert the timber into merchantable forms as fast as the market will receive it. This assertion can be verified by an inspection of the offices of the numerous lumbermen who still operate in this State, and who display maps showing lots, sections and in many instances, whole townships belonging to the company controlling the same. The forest lands so held are doomed, and the length of time they will remain in their present condition is dependent entirely upon the caprice of the owner and no great amount of good can come from any discussion of these lands. Nor is this condition to be entirely deplored. Much of the timber in these forests is already past its prime; especially is this true of the larger tracts of white pine and the crop should be harvested before many years pass by. Yet if we could interest some of these large owners, men who have become millionaires by handling Michigan timber, to use some care in the cutting of these forests, we should accomplish much.

There is always a good strong undergrowth in these wooded tracts, among which are many seedlings of the better sorts of timber, and if these could be preserved the undergrowth around them would shade and protect until they would finally take care of themselves. It is not necessary to remove the old tops and pieces of tree trunks that are always left as debris after cleaning off for timber, no person who is familiar with the woods and the conditions attending the lumbering of a tract of land, would ever advocate the removal of this refuse in order to burn it in some other location, and as a matter of fact, it is much better to let it lie and decay, helping to retain moisture and produce shade and protection for the remaining timber growth. But here we furnish fuel for the forest fire and upon the proper control of this one element almost entirely depends the future of Michigan forestry. Wherever we find stump lands that have not been burned and burned over again, we there find that Nature has done and is still doing her best to restore the conditions which existed before lumbering commenced.

Our government surveyors in the original surveys of the State some sixty years ago, noted numerous windfalls. The small mounds of earth fallen from the roots of the trees which went down before the great tornadoes still mark the route taken, but the valuable growth of timber which has since sprung up is a more substantial tracing.

Sections three, four and nine of Town 23 N., R. 13 W., in Manistee county are good examples. The United States Survey in the early forties noted an extensive windfall "grown up to brush." We find the early settlers avoiding this tract, because of the light timber growth, which to-

day is covered with a fine forest of young basswood, white ash and maple and was recently sold at a good price to a Michigan manufacturing concern. Had this tract been burned over repeatedly just as the seedlings were in their young growth, we should now find the area covered with an inferior growth of worthless stuff, if indeed there were humus enough to support any vegetation at all.

The 10 per cent of the timbered lands still remaining in the hands of the commonwealth is subject to the same management as is the 90 per cent in the hands of large owners. Most of these public lands are well timbered and would have been purchased long ago except for the fact that they are for the most part isolated and too far away from transportation facilities to become of use to manufacturers. They are fast passing from the control of the State, however, and it will not be many years before Michigan as a state will have very little timber to dispose of. Much of the timber belonging to the public is ripe and should be harvested.

If there were some manner in which the public could authorize selected agents to pick out and sell off this timber which is ready to cut, and thereby retain the title in the state, we might consider the plan, but past legislatures have not taken kindly to this idea and always look with suspicion upon any plan which has for its object the disposition of the timber upon public lands, even though the trees are blown or burned down, and fast spoiling in decay. This is to be regretted as a considerable income might have been derived from a saving made along this line—enough to have paid competent wardens for looking after these tracts of woodland. Until some such system of legislation can be had, the maintenance of the present forest areas must be at a loss of much of the valuable timber now standing, as the only method by which the value can be saved is by selling to parties who will cut it.

The maintenance of our present forests has two foes to combat, viz:—timber thieves and forest fires, and destructive as the latter may be and have been, they must bow in insignificance to the pirates who have preyed upon the forests of Michigan ever since there was sale for any of the products. It may seem a broad assertion, but it is a fact, that more than double the amount of timber is stolen from State lands annually than is destroyed by fire. The reason for this lies in the policy pursued in the settlement of trespass committed by these vandals. The State has a good law which should be enforced against this class of people, yet we find that in the hundreds of cases of trespass upon public lands none of the trespassers have ever been prosecuted. Why is this? If one of these people were to go upon the grounds of any of the State institutions and cut down and take away a tree, or commit any other felony, he would be at once punished as any thief should be. Yet the same person can trespass upon the forest lands of the State and run no fear of prosecution whatever. If caught, he will be called upon to pay the stumpage value, which really means that he is buying timber and paying no taxes. One reason why prosecutions have not been had, is the fact that the Attorneys General who have held office from time to time, hold that only the prosecuting attorneys of the county wherein the offence is committed, can commence suit against trespassers upon public lands (yet we find the same Attorneys General flying to the aid of the Game Warden whenever he has occasion to request their services. We assume that it would be quite as reasonable to protect the forests, which will surely become extinct under the present system, as without the forests we can have no game). This



protection can never be effectual through township or county officials, as they are too often implicated in the trespassing, or not competent to conduct the prosecutions if made. Few people in the southern portions of our State fully understand the conditions of this problem. First, it is almost impossible to impanel a jury in the northern counties, the majority of whose members have not themselves some day trespassed upon public lands. Second, in sparsely settled counties, the legal talent available for prosecuting attorney is limited to one or two persons, who are wholly unable to successfully cope with the attorneys which the trespasser will always employ, and the State is the loser thereby. Third, the trespassers and generally the representatives from these northern districts raise the plea that these timber thieves are poor men of family, who are starving and are forced to enter upon these lands and steal to support their families. We challenge this statement, for in an investigation which has extended over the last four years, we have noted that in nearly every instance the trespasser was a man who had a good bank account, and was not forced to steal for a living, but finding it a lucrative business with no risks or taxes, kept at it. He is still at it and still will be until more stringent measures are taken to stop this business, or until the grand old State of Michigan has not a tree left for him to steal. Our suggestions then, as to the maintenance of our present forest areas are entirely along the lines of legislation. We can do nothing with public property without laws governing the same—laws which are so plain and concise that there can be no quibbling or doubt as to their meaning.

These laws should cover, first the matter of trespassers upon State lands, and by trespassers we mean malicious trespassers. There are always some few who by mistaken lines or corners get over the true lines, but these are usually willing to settle and are already well provided for, but we want in addition to the good law we now have for malicious trespassers, a clause compelling the Attorney General of the State to prosecute in arrests made by the authority of the Commissioner of the State Land Office, or a clause authorizing the Land Commissioner to procure competent attorneys to so prosecute without the sanction of the Attorney General.

Second, legislation to prevent the destruction of our present forests by fire. It seems to us that the only solution of this matter is by the selection and appointment of efficient wardens by the State for the purpose. No system which depends upon the township or county officers for its execution, will ever be successful. These wardens must have the sovereign power of the State back of them and in their pockets, and must be entirely removed from political influences. Game Wardens, Fire Wardens and Trespass Agents should all be State agents with full power to make arrests and to prosecute in justice courts as the Game Wardens now do. There is no Game Warden but that knows of trespass upon public lands, and there is no Trespass Agent but that often sees flagrant violations of the game laws, and these men should all be vested with as strong authority to do anything to prevent the destruction of our forests and game as can be given them by any law that can be devised. The duties of the wardens should be to prevent the use of fires wherever there is danger of damage resulting to the surrounding territory, whether owned in private or by the State. We all know the difficulties which attend the fighting of fires in our cities where we have all modern appliances for their subjection, but none of these fires can compare with

the genuine forest fire where great blazing brands go whirling, whizzing, hissing, ten, twenty, and in high winds, even forty rods through the air, spreading fire so swiftly that no human power can stop it. The only place to stamp it out is before the match is lighted. Proper legislation along these lines will, we believe, do more to maintain our forest areas than any other method. If our land owners in both the southern and northern portions of Michigan would plant the sides of gulleys, hills, and rough, stony and unusually valueless ground for agricultural purposes, to forest seedlings, we would soon have an abundance of growing timber and to bring this about, the State should furnish seedlings or seeds of the ash, basswood, butternut, elms, maples, oaks, pines, walnuts and other valuable timbers to those who will use them, and also set aside similar places in its own holdings which are yet covered with forest or which have been denuded of forest by lumbermen or fires, and plant forests and properly care for them.

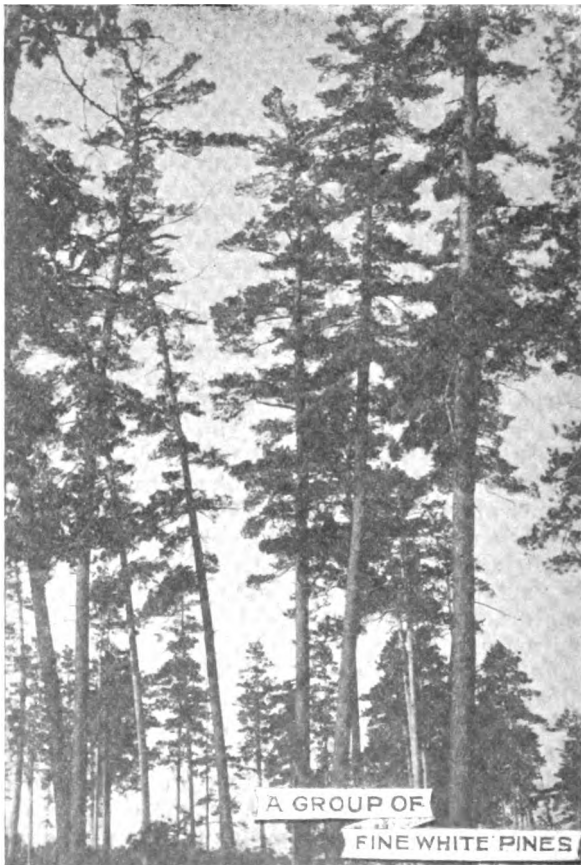
This brings us to the consideration of the stump lands, and by the stump lands we mean those lands which, within the memory of man, have been covered with timber, but which now are divested of everything of value and are patiently waiting for something to make them again valuable. We do not in any sense include the Jack pine plains. These are, however, oases in every desert, and we find them on the plains wherever the clay subsoil comes near enough the surface to retain the moisture, and we usually find here standing the Norway pine, or traces of its having been here; but there are hundreds of thousands of acres of good, fertile stump lands that will have ample time to grow another forest before they are wanted for agricultural purposes, and let us put our efforts here where we can show results. It is possible that the time may come when these plains may be utilized for other than grazing purposes, but it will be when our population has increased to such an extent that proper fertilization and irrigation can be brought with the people and not until then.

The legislation suggested for the maintenance of the present forest areas is also applicable to the stump lands in every feature, but there is need of more study and more clearly defined legislation along this line than the former. Most of these stump lands are or were at one time owned by some one of the wealthy lumber firms which have helped to build our State. In so far as possible, these men and firms should be induced to deed back to the State the lands for which they have no further use, and upon which most of them have ceased to pay taxes, thus again placing the lands under State control. Our present tax law introduces one of the most vexatious problems that we have to solve. If the State cannot give a good title to all tax lands, then there is no use of forestry legislation regarding these vast areas, for if she cannot give title, she has none herself, and we would not advocate the use of public money on the lands of men who only sit back and wait for them to become valuable before again claiming title and taking possession. The State cannot afford to carry on forestry experiments upon lands which she thinks she owns. The State of Michigan should never plant a tree upon lands over which the public has not absolute control and to which she has not a clear title and under the present tax law and the supreme court decisions regarding the same, it would be folly to try to re-forest the larger portion of the stump lands of this State. But once get the lands under the ownership of the Commonwealth and we can, by keeping out fires, reproduce a forest at little expense, of as much or more value than the original, and this by

letting Nature do her own sweet will, aiding by a little judicious planting and pruning.

To summarize:—We must then have legislation whereby we can have wardens to protect forests, stump lands and game from fires and thieves. These wardens should have authority to arrest and commence suit, thereby lessening cost of long journeys of officers in making arrest and expensive and tedious waiting for prosecuting attorneys. It should be the duty of the Attorney General to prosecute all cases when called upon to do so. There should be such a modification of the tax laws as will do away with evasion of tax payment, through error or incompetency of township or county officials; there should be such provision made that finally all lands taken back by the State should be held in the same manner as those to which original titles can now be given.

Influence owners of stump lands to deed back to the State instead of letting lands go back for non-payment of taxes. When the State has thus acquired absolute title to large tracts of stump lands, put them under the charge of competent wardens, help along by planting, pruning and keeping out stock, and we will soon have another forest.



## METHODS OF REFORESTING PINE STUMP LANDS.

W. J. BEAL.

"The vandalism which hews down vast stretches of woodland for gain, without thought or care for the future, has too long gone on unchecked. The injury done by it has often been described and can hardly be exaggerated." (The Providence Journal).

Fortunately for the people of Michigan, the conditions are still such that, if the annual or perennial fires, browsing animals and timber thieves are kept out, the land surface will very soon be clothed with a woody growth. This would come about through the agency of sprouts from living stumps, roots, or grubs of a considerable number of kinds of trees and shrubs that were not completely killed by a burning of the materials on the surface of the soil. Among these may be enumerated nearly all of the broad-leaved trees and shrubs. Again, it is not common to find an area of much size that does not have left standing some one or more old trees with tops still living that were unworthy the attention of lumbermen because of defects. These trees bear seeds every other year, or less frequently, which the kind breezes, the birds or squirrels give free transportation for long distances. Considering the assistance that Nature, unmolested, is ready to bring, my task of telling how to reforest stump lands of Michigan is not as formidable an undertaking as might first appear.

But Nature does her work slowly and often imperfectly. Quicker returns can be made by assisting Nature. Besides keeping out the fire and grazing animals, man can assist Nature by planting four small, desirable trees to nearly every square rod, thus restocking the ground evenly.

In undertaking the proper management of stump lands numerous problems confront us:

1. What kinds of trees shall we plant; shall they be native or foreigners?
2. How many shall we plant to the acre?
3. What preparations shall we give the land?
4. How shall we care for the trees, from seedlings to maturity?
5. How shall we plant to best advantage, and at what season of the year?
6. How large shall the trees be when planted, or shall we rely on sowing and planting seed?
7. Shall we plant one kind of tree on an acre, or shall we plant several kinds?

Prof. C. S. Sargent, Director of the Arnold Arboretum in Massachusetts, long ago began planting many kinds of forest trees, including those from Europe and other countries, and, as late as 1878, recommended for our use the planting of the Scotch pine, European larch, European linden, and several others, but in 1886, and since that time, he has turned completely about. He says "many of the conclusions reached in those papers, however, have not been substantiated by further investigations upon the same subject made during the past ten years. \* \* \* I am now

as fully convinced that the native trees of Massachusetts are better suited to Massachusetts than any exotic trees can be, and that if our woods and plantations are ever to assume real importance, and to make profitable returns upon the money invested in them, they must be composed either wholly or in large part of our native trees."

The white willow of Europe seems to be an exception to the rule just mentioned, as it grows rapidly and reaches large size in this country, and is worth planting if anyone can make use of the lumber.

Most of the trees of Europe which attain much size were long ago planted more or less at the Agricultural College, some of them as early as 1860, and many others previous to 1875. The tests there made lead me to the same conclusion for Michigan that Prof. Sargent reached for Massachusetts. Furthermore, the trials that have been made in Eastern North America lead us to conclude that there is nothing on the Rocky Mountains or on the Pacific Slope that is worth planting for growing timber in Michigan.

Prof. Sargent says further, "the most instructive plantations of Massachusetts are not those which have been made upon the European fashion, or rather with European trees, by men who have studied the subject in Europe or in European books upon forestry. The real progress in silviculture in Massachusetts has been made by the farmers of Barnstable and Plymouth counties, who have taught us how to plant and raise forests successfully and profitably under the most favorable conditions. The secret of their success must be sought where they sought and found it, not in forest treatises, unsuited to the requirements of this community, but in the native woods in full view of their own doorstep, which told them what to plant and supplied them with material for planting.

It has been demonstrated in Barnstable county that a crop of pitch pine can be raised from seed with as much certainty as a crop of corn and with much less expense."

Half a century ago some experiments were begun in Eastern Massachusetts in planting white pines on barren sandy soil. The young trees were set in shallow furrows at odd times, with little expense, at a distance of from five to twelve feet each way, and after planting received no subsequent care whatever. They grew rapidly and vigorously. Prof. Sargent says "Here, no doubt, are the most profitable and successful attempts at silviculture ever made in the United States."

These experiments do not, unfortunately, show "the method of culture which can best be adopted in order to make this tree yield the greatest return. More experiments are needed with the white pine."

Where experiments were made in Massachusetts the land consisted of old fields, clear of stumps and other obstructions, while in Michigan the pine stumps are still left and the intervening spaces are often filled with logs, briars, shrubs and grasses in variety.

In making selections for planting, the nature of the soil and other conditions must be taken into account. On light sands we may not wish to rely on the conifers because of great risk from fire, but on such lands our broad-leaved trees are found to grow but indifferently, making timber of little value. For growing good timber on such lands, judging from our present knowledge, we are reluctantly forced to select some of the cone bearing trees. Still good pine has been grown on land in Michigan that also grew good hardwood. Where white pine or other kinds of first-class trees have been growing to some extent on our wild land and have not

produced good timber, it is a sure sign that it is unsafe to plant such trees for profit; on the other hand, if fire and browsing animals are kept out, it is pretty safe to rely on a good crop of timber on land where one fine crop of trees has been removed.

For Michigan the following kinds have been known to grow well, each in soil suited to it; white pine, Norway pine, American elm, white ash, basswood, sugar maple, black cherry, yellow birch, red oak, and perhaps also with good care, butternut and walnut. Many others have made valuable timber, but most of them grow too slowly for profit, or grow rapidly but make timber of poor quality.

In 1863, Prof. James Satterlee, with his father, planted near Greenville, Montcalm county, a considerable grove of chestnuts, butternuts and black walnuts. All have done well and are now healthy. The leading native trees on such land were white oak and black oak. Such an experiment begun thirty-five years ago, is worth considerable to one interested in tree planting.

In some places it may be profitable to grow aspens and some other poplars, with a view of using the timber for paper pulp.

There is no danger of planting the trees too thickly, but this work costs something. The better kinds selected to plant may be scattered about among the stumps, placing four to the square rod, 640 to the square acre, and among these, and near them, should be other cheap and quick growing trees or shrubs to shade the ground and help keep out grasses, herbaceous plants and weeds. For cheap nurse trees, to start quickly and shade the ground, there appears nothing better than box elder. On the light sand, jack pine started from the seed, is first rate.

What preparations shall be given the land?

To cover every case the answers would be numerous and long, because of varied conditions. If much rubbish is left unburned it may be best to fire it and clear the land. If grass and pasturing have left the surface with a good deal of sod, plowing will be beneficial, but this is not always possible. In case it is not, dig over a space two feet or more in diameter wherever a small tree is planted. In most places the ground is already somewhat shaded by trunks of small trees. In this case no preparation is needed, possibly, excepting the reduction of neighboring bushes the better to expose to light the young tree you are planting. Bear in mind that this planting anew has to be done but once for all time, and the work should therefore be well done.

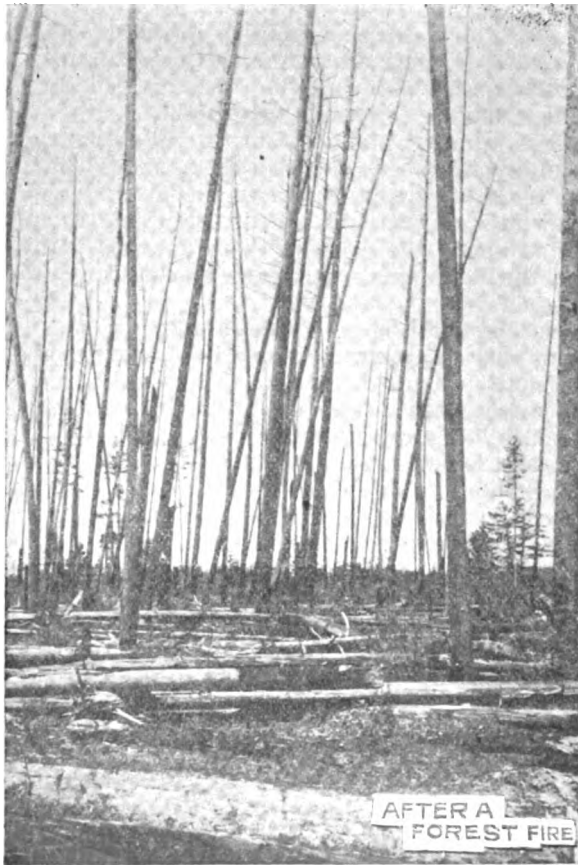
After setting the young trees what care will they need?

Rigidly keep out fire and grazing animals. While your choice saplings are yet small, pass over the ground from year to year and lop off the tops of the surrounding bushes, if they reach much above those you are caring for. If two branches to the main trunk are very nearly equal in size, cut one off or remove a part of it, thus sending more vigor into the remaining branch, that a straight trunk may be produced. After the trees have grown so large that a crop is to be harvested there are two ways to proceed. One is to cut off every tree of any value and allow sprouts or seedlings to renew the forest, the other is to keep taking out from time to time a tree here and there as it is needed, leaving the rest to grow. On hilly land the latter method is always preferable.

Evergreens are best planted just as the buds are pushing in the spring, other trees may be planted in the spring or fall, while they are destitute of leaves.

For setting out seedlings that are six inches to a foot high in unplowed ground if the obstructions are not too numerous, two men with long-handled dibbles and a boy to handle the plants kept moist, can plant from four to five thousand per day, enough for seven acres of land. The boy should carry with him a mixture of trees of several kinds. The man thrusts a dibble into the ground, a seedling goes into the hole, the dibble is thrust again into the ground and pried toward the young tree, closing in the earth about it. If the earth is packed a little about the tree all the better.

Chestnuts, acorns and the like, should be planted one in a place, about two inches deep, where the trees are needed. This should be done usually in the spring, for then there is less risk of destruction by squirrels. The nuts may be kept over winter without loss of vitality, by burying on high land in twice their bulk of sand.



AFTER A  
FOREST FIRE

An experienced gardener knows that the roots of a young tree when exposed to dry air will live just about as long as a trout or a black bass in the same situation; the inexperienced or thoughtless person might lose most of his labor in tree planting by not knowing this fact.

The trees to be set should usually be four to twelve inches high. At this size they cost less, can be more easily planted and are more likely to make good trees.

As a guide to the selection of trees for each kind of soil or location, plant those species that formerly grew in such places. Chestnuts, if planted, should be placed in soil that is sandy or gravelly, high enough and well drained.

I suggested that the boy helping in the work should carry a mixed bunch of the trees, that the different kinds be grown together. But why mix them, you ask? Trees so planted are less liable to the attacks of insects or fungi; less liable to loss from fire or wind; they economize the room above the soil and below the surface to better advantage. Their likes and dislikes are not just the same. Pines, beeches, oaks, maples, box elders and some others will hold their lower branches covered with living leaves very well in the shade, while ashes, walnuts and chestnuts are impatient of shade and cannot be grown closely enough together to keep out grass and weeds. It would be a mistake to attempt to grow white ashes or chestnuts by the acre, each sort by itself.

I shall not here attempt to produce a complete treatise on growing and managing seeds and seedlings, but a few words seem necessary.

In case you fail to secure seeds or to grow seedlings when you need them, they can be purchased at very low prices of some nurseryman. The man who has little horticultural tact will find it cheaper to buy; the man who has the tact needs little instruction from me. To grow seedling evergreens and other delicate things, secure a spot not likely to become very dry nor to become flooded with water. The soil should be good, with a surface of rich sandy loam or leaf mold. Above this should be shade. This spot should be but little exposed to wind. With a little care such places may be selected in almost any forest, though, the spreading roots are in the way and draw out the moisture. To produce the shade it will cost but little to set or drive posts five or six feet high, and from the tops of one to the other put on horizontal strips or poles, on which throw some fine brush destitute of leaves. Here you can grow seedlings with success. Sow the seeds in rows six to eight inches apart, covering them but slightly with one-fourth of an inch of light soil. Never let the ground get dry, nor become soaked with water for a very long time, nor exposed to the sun, nor become choked with weeds. Seeds of elms, birches and maples should be planted as soon as gathered or not long after. If seeds of ashes become dry before planting in the open (as they may be with safety), they should be soaked a day or two in water till they become swollen.



## RELATION OF METEOROLOGY TO FORESTRY IN MICHIGAN.

BY R. C. KEDZIE.

The controlling influence of climate over forest growth is well recognized. The distribution of plants over the earth's surface is to a large extent determined by climate, but moisture as an element of climate is controlling. The climatic conditions, as related to forest growth, and especially in connection with the question of reforestation our denuded northern plains become matters worthy of consideration.

## FOREST GROWTH.

The conditions favorable to growth of trees are good soil, proper temperature and moisture. Failure of any one of these will limit or prevent arboreal growth. A good illustration of the limitation by a poor soil is furnished in the government forests of Germany. Prof. F. S. Kedzie in a recent letter writes: "I have been all over the Royal Forest. It lies outside of the city about ten miles and is carefully watered and taken care of by a small army of foresters. The trees are all pines, planted a great many years ago, and through the forest run wild boar, deer and other game. I saw one lone red squirrel during my tour, which lasted over four hours. Only the Kaiser and his guests ever shoot or hunt the game here. \* \* \* At one point I found a plot of pines which was planted in 1889, but the result must try even the patience of a German—the average height was not more than four feet.

I was disappointed in the appearance of the trees in the forest—they don't compare with ours at home, and I expected they would be much larger on account of the more abundant rainfall. When I told the German friend who was with me that they were beginning to agitate the forest question in Michigan he seemed greatly astonished that a man was permitted to cut down trees without planting as many acres as he cleared. There is one thing clear to my mind; we don't need to try any experiments in forestry with pine trees—the millennium is too near."

The limiting conditions for forest growth are not found in our soil, which is in striking contrast with the thin sands of Prussia; but in certain sections the climatic condition, especially the rainfall, is the problem to be solved. While the climate of Michigan on the average is satisfactory, yet it still must be characterized as capricious—subject to wide variations from year to year. The influence of these climatic variations is shown in corresponding variations in tree growth. Spruce trees have grown for many years on the college lawn. When cut down, and a cross section of the trunk is examined, the concentric layers of annual growth clearly point out the good years of abundant rainfall, while the thin rings show the years of unfavorable climatic conditions. The meteorological tables for the last 34 years at this college, when compared with "the tables in wood" of annual growth, show very clearly the relations of climate to forest growth.

## FORESTS AND MOISTURE.

Much has been written about the relation of forests to rainfall; some claiming that rain is increased by forests, and others that there is no connection between them.

Geo. P. Marsh in his admirable work "Man and Nature," has pointed out how forests restrain the rapid escape of the rain; preserving springs and small streams, retarding floods, and mitigating drought. Their influence in preventing the drifting of snow and keeping an even covering of that wonderful blanket for the sleeping earth, is well recognized.

The influence of forests in diminishing evaporation by restraining the velocity of the wind at the surface of the ground is worthy of consideration. I do not refer to the well-known influence of tall forests in restraining the violence of the wind as a body, but to the influence of forests, shrubs and vegetable growth of every kind in keeping the air quiet at the ground level, where alone soil evaporation takes place.

To obtain some measure of the relative rapidity of evaporation in a draft and in comparatively still air; the following experiment was tried: The air in one part of the chemical lecture room was so nearly still that a feather would not move perceptibly; by opening windows in another part of the room a strong draft could be secured at one window, the wind blowing 12 miles an hour. Two square pieces of Turkish towel of same size, were thoroughly wet, just short of dripping, then weighed separately, one suspended in the still air of the room for an hour, while the other was similarly hung in the draft by the window, or in the mouth of the ventilating shaft. Both were left for an hour, then weighed again and the loss in weight showed the amount of water evaporated in each case. The trial was made seven times, with the result that the evaporation was four times greater in the draft than in the still air. The actual amount evaporated was not the same for each hour, but the ratio of evaporation was almost identical in the whole series, viz: four times as much in the draft as took place in the still air.

The reason for this is not hard to find. A volume of perfectly still air surrounding a wet body will take up moisture with progressive slowness till the air is saturated; but if this damp air is blown away and replaced by relatively dry air, evaporation will go on with increased rapidity, and if the air is constantly renewed as in a draft of wind, the evaporation will be more rapid. Every washer-woman knows that the clothes will soon blow dry when hung out in a stiff breeze, but will take hours if lined up indoors.

The principle of my laboratory experiment will hold in the broad open of Nature. The air in contact with the moist ground will take up water till it is saturated and then evaporation will be suspended, provided the air remains still and undisturbed. But if this bottom air is swept away by wind, evaporation will be renewed and the drying of the soil will again go on. The influence of trees, shrubs and even the grasses in preserving in some degree this shallow pool of quiet air at the ground level and thus diminishing evaporation from the soil may seem a trifling matter at first thought, but becomes of great moment on the large scale of nature.

## RELATION OF SOIL TO MOISTURE.

The capacity of a soil to imbibe and retain water is intimately connected with its composition. The open and porous soils of a sandy character,

take up water most readily, retain it in least quantity and part with it most rapidly by evaporation. One hundred parts of pure sand will take up 25 parts of water, and will lose 22 parts by evaporation in four hours when spread out in a thin sheet in dry air. Such soil is well called leachy and very subject to drought.

If to such sand, clay, oxide of iron and marl, carbonate of lime, are added, the power of such mixed soil to retain water is much improved, but the material that has the greatest influence, and the one most within our control is humus or the organic matter of soil. An experiment showed this clearly. A glass funnel was used holding a very small filter paper in its throat (and thoroughly wet) to prevent the sand flowing through. Into this funnel 100 grains of dry sandy soil from Grayling were placed, and water poured over the sand till completely wet, and the excess of water drained off till dripping had ceased. This soil contained 95 per cent. of sand and  $2\frac{1}{4}$  per cent humus. It took up and retained by capillary attraction 29 per cent. of water. Left undisturbed for 3 days in the shade it lost 27.7 parts of water, retaining only 1.3 parts out of the 29.

A soil was prepared by mixing two parts of Grayling sand with one part of Kalamazoo muck (containing 63.76 per cent. of humus). The materials were thoroughly mixed and sifted and 100 grains of the mixed soils were placed in a glass funnel the same as in former experiment, and water poured over it till saturated, when it was found that 100 parts of this soil took up and retained 65 parts of water. On leaving it exposed for 3 days in the same way, the soil lost 45 parts of water, but still retained 20 parts of the original 65. In other words, the addition of 21 per cent. of humus to a sand containing  $2\frac{1}{4}$  per cent of organic matter, more than doubled its capacity to take up water by capillarity, and increased by more than 15 fold its power to resist evaporation.

A similar set of experiments, using jelly cups in place of funnels, gave concordant results. It is thus shown that the beneficial influence of the organic matter of the soil in mitigating drought in sandy soils is twofold: assisting such soil to take up and hold the rain when it falls, and preventing excessive loss by evaporation.

The damage by forest fires sweeping over the country, burning up leaves and grasses which would form humus, and consuming much of the humus already in the soil, becomes evident to all. These forest fires inflict incalculable injury upon our northern plains. The thwarting of Nature's efforts at reforesting, by burning up all trees and shrubs too young to resist the fire, is clearly seen as one travels over the blackened country.

Keep out the fires is the first and great commandment in forestry for Michigan. Without this no effort at reforesting will accomplish much.

#### METEOROLOGICAL OBSERVATIONS FOR THIRTY FOUR YEARS AT THE MICHIGAN AGRICULTURAL COLLEGE.

To satisfactorily study these questions of the relation of climate to forestry, we need a long series of observations taken at leading points in the State. Unfortunately these are wanting, but as a contribution to this end the following mean monthly observations at the Agricultural College are presented. They are too local to be decisive of the average climatic condition of our State, but may yet be of some value in future studies.

*Abstract of the Meteorological Observations taken at the State Agricultural College for thirty-four years from 1864 to 1897.*

By R. C. KEDZIE, Professor of Chemistry.

Year.	JANUARY.						FEBRUARY.					
	Mean Temperature.	Pressure of Vapor.	Relative Humidity.	Barometer reduced to frost point.	Cloudiness.	Rain.	Mean Temperature.	Pressure of Vapor.	Relative Humidity.	Barometer reduced to frost point.	Cloudiness.	Rain.
1864	°22.26	.105	66	28.875	66	0.94	°27.32	.150	70	28.771	69	0.27
1865	21.10	.090	72	28.887	77	0.65	27.59	.118	75	28.949	75	1.76
1866	21.16	.104	82	29.013	74	2.08	22.71	.111	81	28.970	71	2.28
1867	17.61	.091	87	28.857	76	1.68	30.89	.152	85	28.904	71	3.23
1868	19.00	.090	80	28.894	82	1.47	18.72	.093	83	29.014	65	1.28
1869	29.38	.162	96	28.830	66	0.87	26.66	.148	95	28.839	71	2.95
1870	25.37	.125	85	28.867	80	1.93	24.25	.112	84	28.807	65	1.20
1871	24.75	.135	93	28.903	82	3.95	25.65	.132	90	28.816	69	1.73
1872	21.59	.107	88	28.838	71	0.43	21.34	.100	84	28.842	50	0.49
1873	15.87	.099	95	28.873	79	2.98	19.10	.110	95	28.847	61	0.77
1874	27.70	.135	88	29.048	75	3.53	25.51	.128	89	28.928	70	1.55
1875	12.87	.074	88	29.005	76	1.81	27.99	.075	91	28.875	53	2.20
1876	30.22	.157	84	29.078	58	1.63	27.38	.131	84	29.063	58	3.04
1877	18.07	.097	91	29.057	64	1.83	32.31	.155	85	29.124	45	0.00
1878	29.11	.135	89	29.123	76	1.12	28.07	.138	89	29.029	56	2.74
1879	19.19	.099	89	29.130	68	0.49	20.40	.105	92	29.107	73	1.43
1880	37.10	.171	75	28.995	63	2.67	29.19	.144	68	29.007	63	1.62
1881	16.98	.082	81	29.077	65	2.27	21.58	.122	93	29.152	68	3.77
1882	24.89	.125	89	29.144	72	1.47	35.12	.156	75	29.053	56	2.28
1883	14.39	.077	95	29.129	67	1.53	19.76	.106	93	29.252	61	4.50
1884	15.46	.093	93	29.130	77	1.23	23.43	.135	92	29.093	85	3.69
1885	15.34	.113	90	29.144	75	2.70	8.94	.124	91	29.005	49	0.73
1886	18.78	.106	91	29.074	77	2.66	22.27	.132	86	29.106	65	1.35
1887	18.20	.101	90	29.000	71	3.25	24.26	.127	89	29.176	78	5.71
1888	15.40	.085	89	29.202	77	2.18	21.95	.112	81	29.070	61	1.70
1889	28.04	.175	84	29.008	71	1.53	18.25	.092	85	29.091	73	1.17
1890	31.54	.161	87	29.146	72	2.31	31.54	.152	84	29.073	69	1.79
1891	26.72	.137	90	29.092	70	0.82	26.67	.137	81	29.055	68	2.20
1892	19.20	.098	86	29.064	63	0.96	27.30	.139	86	29.133	79	1.93
1893	14.80	.082	82	29.008	73	1.78	21.31	.098	87	29.115	66	1.83
1894	26.88	.131	83	28.989	64	1.37	21.15	.100	77	29.016	58	0.53
1895	17.50	.095	88	28.966	66	1.04	16.40	.091	81	29.055	66	0.12
1896	24.65	.136	96	29.117	76	0.79	24.28	.138	96	28.916	67	1.51
1897	22.34	.136	97	29.124	73	4.17	26.38	.146	97	29.090	80	0.67
Means	21.87	.114	87	29.020	72	1.81	23.69	.124	86	29.010	66	1.88

*Abstract of the Meteorological Observations.—Continued.*

Year.	MARCH.						APRIL.					
	Mean Temperature.	Pressure of Vapor.	Relative Humidity.	Barometer reduced to frost point.	Cloudiness.	Rain.	Mean Temperature.	Pressure of Vapor.	Relative Humidity.	Barometer reduced to frost point.	Cloudiness.	Rain.
1864	31.74	.155	77	28.764	68	2.26	45.86	.275	84	28.848	76	3.87
1865	36.96	.182	74	28.806	68	2.79	47.40	.248	74	28.815	66	2.32
1866	29.06	.140	83	28.959	71	3.39	48.94	.236	64	28.848	57	1.41
1867	29.72	.134	88	28.930	72	0.68	48.20	.196	57	28.752	60	2.19
1868	37.80	.213	87	28.887	63	4.65	43.68	.224	56	28.911	56	1.83
1869	27.60	.124	82	28.934	67	1.65	45.70	.222	67	28.827	61	3.42
1870	30.28	.148	84	28.845	75	3.01	50.39	.267	76	28.902	50	2.02
1871	38.18	.194	83	28.810	66	3.91	49.80	.261	74	28.722	63	2.97
1872	24.75	.109	85	28.911	54	2.04	47.39	.260	74	28.852	52	1.26
1873	28.30	.142	86	28.882	62	1.73	43.17	.220	76	28.798	73	3.88
1874	32.30	.161	83	28.895	54	1.79	38.87	.169	75	28.941	46	1.67
1875	26.20	.136	87	28.844	49	1.02	41.11	.182	69	29.047	45	0.61
1876	30.55	.150	95	28.929	65	4.84	44.16	.195	66	29.000	51	2.08
1877	24.51	.127	91	28.981	63	5.60	46.16	.214	30	28.974	50	4.14
1878	40.90	.219	83	29.072	72	3.12	50.55	.269	69	28.874	59	3.76
1879	33.19	.152	78	29.102	56	1.57	44.84	.195	66	29.050	44	1.25
1880	35.50	.145	79	29.181	56	1.70	45.87	.232	74	28.884	48	6.10
1881	30.28	.145	86	28.899	67	2.66	45.59	.200	71	29.054	49	1.75
1882	35.96	.163	77	29.110	68	3.58	44.70	.202	67	29.101	57	1.88
1883	24.89	.113	93	29.059	48	0.71	43.48	.118	69	29.042	54	1.90
1884	29.89	.149	86	29.083	55	3.67	43.66	.193	68	29.028	57	1.95
1885	21.26	.159	88	29.096	52	0.58	43.59	.223	73	29.097	60	2.47
1886	31.33	.169	80	29.013	60	2.63	50.18	.356	73	29.113	57	1.99
1887	28.29	.124	78	29.118	54	1.78	45.37	.204	66	29.048	58	0.90
1888	27.03	.123	79	29.154	62	1.88	44.03	.179	61	29.202	49	1.15
1889	37.60	.151	72	29.010	51	1.22	46.59	.212	68	29.069	56	2.02
1890	28.20	.129	79	29.100	56	1.54	47.20	.226	68	29.159	46	3.20
1891	29.27	.133	80	29.124	71	2.41	47.44	.237	70	29.080	55	1.74
1892	29.86	.129	77	29.121	52	1.31	44.50	.202	63	29.107	50	2.04
1893	28.16	.148	85	29.063	57	2.82	43.50	.228	75	28.978	71	4.81
1894	40.06	.203	77	29.008	63	1.25	48.44	.249	72	29.055	61	2.76
1895	27.20	.125	80	29.064	54	0.27	48.57	.255	74	29.062	49	0.67
1896	28.70	.159	95	29.052	52	1.31	52.64	.376	81	29.067	46	2.77
1897	33.00	.190	94	29.085	65	2.08	44.58	.282	90	29.143	65	2.74
Means	30.84	.151	83	28.996	61	2.28	46.00	.232	70	28.996	56	2.40

*Abstract of the Meteorological Observations.—Continued.*

Year.	MAY.						JUNE.					
	Mean Temperature.	Pressure of Vapor.	Relative Humidity.	Barometer reduced to frost point.	Cloudiness.	Rain.	Mean Temperature.	Pressure of Vapor.	Relative Humidity.	Barometer reduced to frost point.	Cloudiness.	Rain.
1864	60.19	.470	77	28.787	62	2.87	67.62	.632	81	28.949	48	3.88
1865	57.65	.373	76	28.807	54	1.77	70.76	.596	82	28.868	54	3.55
1866	55.04	.261	59	28.823	49	3.48	66.60	.488	74	28.783	64	5.37
1867	51.11	.234	62	28.781	69	3.81	71.61	.556	73	28.872	46	2.83
1868	59.08	.336	66	28.822	46	2.80	68.46	.317	76	28.966	45	3.55
1869	56.02	.322	70	28.749	70	2.03	64.45	.496	80	28.856	65	4.40
1870	64.32	.441	73	28.857	39	1.16	70.87	.528	77	28.880	42	7.27
1871	61.39	.403	72	28.904	37	1.97	68.21	.522	74	28.865	42	2.93
1872	58.48	.380	77	28.868	60	3.72	71.82	.616	78	28.879	49	3.45
1873	56.98	.345	72	28.826	58	3.03	70.60	.534	73	28.840	40	2.96
1874	59.58	.323	62	28.844	47	1.77	70.61	.559	75	28.878	54	5.07
1875	60.82	.334	67	29.061	47	4.48	66.57	.497	65	29.029	52	1.84
1876	57.95	.319	73	29.009	52	4.13	68.14	.539	79	28.911	50	4.34
1877	58.25	.337	66	29.056	34	2.23	65.93	.476	75	29.020	51	3.53
1878	54.57	.290	61	29.020	54	3.44	64.08	.441	73	29.030	45	3.15
1879	58.76	.321	64	29.116	40	2.45	66.02	.478	75	29.073	43	2.87
1880	64.30	.533	71	29.061	41	5.59	67.60	.532	79	29.065	47	5.04
1881	65.24	.448	71	29.116	37	2.11	64.31	.472	78	29.018	58	4.87
1882	52.73	.269	66	29.077	53	4.04	66.49	.471	72	28.971	53	5.57
1883	52.78	.289	72	29.007	66	5.66	65.87	.530	81	28.998	62	11.35
1884	56.90	.342	73	29.007	50	3.95	68.92	.527	76	29.268	41	2.83
1885	55.76	.353	67	28.938	55	2.30	64.69	.576	75	29.105	43	6.01
1886	58.06	.457	79	29.036	46	2.67	65.72	.589	73	29.068	47	1.92
1887	64.28	.401	68	29.096	36	2.42	68.53	.500	73	29.107	47	2.47
1888	53.65	.305	68	29.023	64	3.66	67.89	.497	72	29.082	44	2.51
1889	57.37	.269	64	29.009	52	3.61	62.83	.439	79	29.057	65	3.42
1890	53.70	.299	70	28.960	58	4.98	70.30	.532	73	29.083	50	3.92
1891	55.69	.275	61	29.164	36	1.63	67.40	.498	73	29.062	50	2.55
1892	54.50	.322	76	29.003	70	5.92	67.70	.561	83	29.019	59	4.33
1893	54.40	.316	75	28.964	52	2.86	66.60	.532	78	28.767	40	4.85
1894	56.94	.355	75	28.967	62	4.83	71.38	.551	72	29.039	42	1.30
1895	61.80	.392	67	29.098	46	2.06	71.40	.521	68	29.151	40	1.01
1896	66.48	.547	83	29.035	41	3.14	69.87	.622	83	29.080	44	2.60
1897	55.79	.421	90	29.089	49	3.29	64.21	.562	88	29.050	52	2.57
Means	57.96	.366	70	28.973	51	3.23	67.77	.524	76	28.989	49	3.52

# FORESTRY BULLETIN

*Abstract of the Meteorological Observations.—Continued.*

JULY.						AUGUST.					
Mean Temperature.	Pressure of Vapor.	Relative Humidity.	Barometer reduced to frost point.	Cloudiness.	Rain.	Mean Temperature.	Pressure of Vapor.	Relative Humidity.	Barometer reduced to frost point.	Cloudiness.	Rain.
74.52	.788	80	28.925	46	1.25	70.72	.558	82	28.854	68	0.39
65.60	.535	85	28.788	64	3.91	65.84	.542	85	28.953	53	3.38
71.72	.629	74	28.903	52	4.19	62.60	.464	81	28.884	66	3.44
71.60	.547	70	28.915	44	1.78	69.78	.522	74	28.911	39	1.74
77.19	.782	77	28.912	44	1.11	70.33	.545	73	28.943	50	2.42
70.35	.590	79	28.844	53	5.77	70.58	.598	75	28.968	48	4.85
74.40	.659	79	28.836	48	8.02	70.11	.594	81	28.890	50	5.58
70.60	.579	77	28.891	49	3.10	71.19	.586	78	28.907	44	1.42
74.91	.671	77	28.924	47	3.36	71.22	.650	83	28.967	50	4.18
70.82	.575	75	28.914	51	5.12	69.49	.559	79	28.927	45	0.80
72.02	.539	71	28.907	37	2.56	69.39	.527	74	28.924	31	1.28
69.67	.535	78	29.044	46	2.42	65.48	.470	77	29.025	47	1.47
72.48	.617	78	29.009	46	2.10	71.55	.576	76	29.048	43	1.28
71.43	.522	70	29.062	44	2.25	68.46	.519	78	29.046	49	6.57
73.04	.639	68	29.084	37	2.96	70.15	.535	74	29.009	40	1.85
74.03	.573	71	29.057	36	2.19	70.00	.494	70	29.100	35	1.61
69.04	.559	78	29.069	45	6.27	68.58	.571	82	29.126	52	6.02
73.14	.590	73	29.093	38	1.81	72.69	.540	70	29.107	40	1.63
67.71	.485	72	29.108	43	2.32	69.52	.608	88	29.074	54	5.72
68.94	.569	80	29.072	54	11.27	64.90	.452	74	29.154	34	0.18
67.95	.524	76	29.016	46	2.60	66.91	.498	75	29.132	36	1.30
72.70	.599	71	29.062	43	2.52	63.62	.545	80	29.061	52	5.82
70.68	.711	65	29.084	48	0.65	69.30	.665	71	29.062	44	4.69
75.51	.556	65	29.104	36	1.50	67.96	.427	66	29.117	48	0.89
70.53	.514	71	29.119	43	2.40	67.55	.476	71	29.103	42	1.87
70.19	.579	78	29.141	42	3.41	68.56	.493	71	29.070	32	0.68
71.07	.481	65	29.104	33	0.92	65.40	.452	71	29.137	42	3.60
65.30	.432	70	29.109	37	1.88	67.93	.479	67	29.134	44	4.82
70.29	.539	73	29.178	32	2.00	68.30	.521	75	29.111	37	5.12
71.50	.571	75	29.069	39	1.86	65.10	.537	78	29.119	31	0.56
73.22	.559	65	29.084	29	0.86	68.80	.591	83	29.035	42	0.00
70.50	.525	72	29.103	45	1.47	71.20	.616	80	29.050	41	4.64
71.83	.701	68	29.070	53	6.73	69.99	.683	89	29.067	45	4.78
73.79	.743	88	29.017	32	8.49	65.94	.566	88	29.066	29	1.69
71.39	.589	75	29.017	44	3.27	68.59	.543	77	29.084	44	2.80

*Abstract of the Meteorological Observations.—Continued.*

Year.	SEPTEMBER.						OCTOBER.					
	Mean Temperature.	Pressure of Vapor.	Relative Humidity.	Barometer reduced to frost point.	Cloudiness.	Rain.	Mean Temperature.	Pressure of Vapor.	Relative Humidity.	Barometer reduced to frost point.	Cloudiness.	Rain.
1864	59.62	.475	81	28.902	66	3.53	45.74	.256	80	28.821	72	1.85
1865	67.66	.522	88	28.954	63	4.79	46.50	.265	83	28.905	54	2.79
1866	55.80	.407	85	28.956	64	5.81	49.50	.307	82	28.979	66	3.57
1867	56.60	.438	77	29.000	37	1.42	50.60	.285	77	28.960	45	2.11
1868	58.77	.378	80	28.936	59	2.95	45.19	.240	73	29.000	57	1.11
1869	63.45	.459	83	29.020	41	1.43	40.80	.219	86	28.920	68	1.72
1870	63.66	.490	88	29.022	51	2.85	52.45	.346	85	28.939	66	2.29
1871	59.10	.391	78	29.038	48	0.79	53.91	.307	72	28.909	53	1.43
1872	62.03	.493	85	28.890	43	5.21	47.44	.295	84	28.979	47	0.67
1873	67.38	.383	80	28.928	48	3.50	44.68	.245	80	28.917	55	1.91
1874	62.85	.422	86	28.964	36	1.27	49.10	.282	78	28.953	58	0.49
1875	58.50	.388	76	29.031	51	2.89	42.93	.219	76	29.016	64	5.81
1876	56.30	.391	83	28.995	57	3.65	43.74	.220	76	28.929	59	1.26
1877	61.28	.430	80	29.121	36	1.38	50.83	.314	83	29.077	66	5.69
1878	63.15	.477	78	29.156	45	3.43	43.33	.269	76	29.030	54	1.99
1879	56.21	.356	78	29.132	47	3.19	57.28	.395	76	29.160	55	1.57
1880	55.83	.439	74	29.098	46	3.10	46.23	.260	81	28.130	52	2.51
1881	69.69	.515	73	29.077	50	2.91	52.51	.346	84	29.131	67	5.56
1882	59.98	.429	83	29.196	43	0.67	52.67	.330	81	29.124	50	2.64
1883	56.43	.360	78	29.162	53	2.34	46.17	.256	78	29.158	70	3.66
1884	65.06	.481	76	29.130	36	3.34	50.91	.322	80	29.195	53	5.73
1885	58.94	.431	78	29.215	44	3.75	44.95	.283	83	29.056	60	3.06
1886	62.07	.539	80	29.148	55	5.40	52.37	.370	73	29.266	49	0.95
1887	58.86	.373	75	29.200	48	4.72	44.97	.237	75	29.103	60	1.86
1888	57.76	.327	71	29.128	45	1.89	45.70	.238	76	29.027	70	3.00
1889	61.14	.379	72	29.157	40	0.79	44.19	.184	69	29.061	64	0.65
1890	57.70	.367	76	29.230	48	1.67	49.11	.284	80	28.981	70	4.56
1891	65.10	.470	72	29.222	35	1.10	41.81	.252	71	29.158	51	0.82
1892	60.80	.418	77	29.132	41	2.17	48.30	.281	78	29.096	42	0.78
1893	58.40	.463	88	28.993	42	1.84	49.70	.311	81	28.980	45	3.61
1894	63.66	.491	80	29.103	45	2.59	49.80	.308	85	28.982	67	1.91
1895	66.60	.568	82	29.158	32	0.85	45.00	.274	86	29.084	41	1.41
1896	57.62	.459	92	29.064	60	6.73	44.61	.282	89	29.090	42	1.06
1897	62.92	.535	87	29.267	19	0.80	53.06	.375	88	29.227	30	2.75
Means	60.91	.439	80	29.081	46	2.79	48.18	.26	80	28.954	57	2.42



*Abstract of the Meteorological Observations.—Continued.*

Year.	NOVEMBER.						DECEMBER.					
	Mean Temperature.	Pressure of Vapor.	Relative Humidity.	Barometer reduced to frost point.	Cloudiness.	Rain.	Mean Temperature.	Pressure of Vapor.	Relative Humidity.	Barometer reduced to frost point.	Cloudiness.	Rain.
1864	37.88	.193	77	28.814	73	4.12	24.37	.111	73	28.777	77	3.20
1865	38.63	.193	81	28.947	54	0.68	26.72	.121	80	28.891	75	1.43
1866	37.94	.189	81	28.916	71	2.60	25.53	.123	79	28.893	76	1.90
1867	40.44	.192	72	28.832	56	1.77	25.31	.118	76	28.868	78	1.34
1868	36.77	.193	84	28.909	70	2.44	21.16	.114	90	28.938	74	1.35
1869	32.05	.156	86	28.863	77	1.92	28.16	.126	82	28.999	78	2.11
1870	39.40	.187	80	28.903	51	0.91	24.80	.139	91	28.772	79	2.57
1871	31.95	.160	86	28.964	69	1.25	21.12	.108	86	28.880	81	1.76
1872	29.80	.158	89	28.881	69	0.98	15.74	.092	91	28.992	72	1.06
1873	28.49	.148	89	28.833	75	2.03	29.54	.158	89	28.929	75	3.02
1874	35.00	.145	77	28.937	63	1.61	26.96	.135	85	29.001	65	0.37
1875	32.96	.155	84	29.054	67	1.11	31.58	.172	80	28.935	75	2.80
1876	36.38	.191	85	28.953	80	0.91	15.23	.088	92	29.203	72	1.29
1877	35.24	.188	87	29.099	73	3.67	36.57	.203	89	29.180	71	1.03
1878	36.29	.188	87	29.081	68	2.16	21.29	.103	95	29.147	83	2.27
1879	38.22	.198	75	29.027	68	4.55	27.46	.129	80	29.032	84	3.55
1880	27.45	.143	89	29.192	70	2.32	22.07	.118	91	29.155	77	0.85
1881	38.20	.190	79	29.129	74	4.09	34.31	.168	84	29.184	67	1.75
1882	36.80	.165	85	29.187	75	1.83	24.80	.128	92	28.124	86	0.58
1883	36.08	.194	80	29.128	58	3.98	26.89	.130	86	29.124	65	1.28
1884	34.11	.169	83	29.123	61	1.84	24.71	.140	90	29.139	87	4.15
1885	37.22	.178	84	29.013	79	2.90	27.75	.124	90	29.062	82	2.14
1886	33.94	.152	78	29.061	64	1.48	19.74	.105	87	29.186	69	1.56
1887	35.66	.161	80	29.096	55	2.28	27.30	.131	87	29.026	74	3.32
1888	38.50	.196	82	29.167	62	3.12	30.39	.145	83	29.070	72	1.20
1889	37.39	.193	84	29.061	72	2.67	36.75	.184	82	29.063	55	2.61
1890	39.06	.185	77	29.081	57	2.30	26.45	.114	81	29.083	62	1.12
1891	33.90	.175	81	29.097	80	3.34	31.55	.160	78	29.074	56	1.47
1892	34.20	.169	83	29.098	82	1.84	25.59	.113	89	29.092	83	1.52
1893	35.63	.183	87	28.993	62	2.19	27.60	.291	83	28.984	79	2.28
1894	32.48	.164	86	29.056	74	0.97	30.12	.157	86	29.075	68	0.98
1895	35.40	.204	80	29.122	63	3.87	28.50	.161	92	29.005	70	5.39
1896	37.09	.231	92	29.112	71	1.05	28.13	.152	91	29.047	74	0.80
1897	36.49	.204	89	29.154	63	2.91	52.62	.148	96	29.085	72	2.02
Means	34.51	.181	83	29.027	68	2.29	26.54	.139	86	29.082	72	1.96

*Abstract of the Meteorological Observations.—Recapitulation.*

Years.	THE YEAR.						
	Mean Temperature.	Pressure of Vapor.	Relative Humidity.	Barometer reduced to frost point.	Cloudiness.	Rain and melted snow.	Snow in inches.
1864.....	48.99	.347	76	28.980	66	28.87	31.5
1865.....	47.70	.313	80	29.001	63	29.82	30.0
1866.....	45.61	.284	77	29.033	65	39.51	42.5
1867.....	46.95	.297	75	29.002	55	24.58	52.0
1868.....	46.34	.298	79	29.031	59	16.45	56.5
1869.....	46.27	.302	82	29.007	59	33.17	56.0
1870.....	49.10	.347	83	28.998	58	37.76	54.0
1871.....	49.90	.307	80	28.988	59	27.21	54.0
1872.....	45.54	.328	82	29.007	57	16.81	42.5
1873.....	41.54	.285	82	28.994	60	31.74	75.5
1874.....	47.05	.277	79	29.055	58	32.00	32.0
1875.....	43.06	.287	79	28.998	56	28.21	63.5
1876.....	46.17	.300	81	29.049	58	30.55	46.5
1877.....	47.42	.299	80	29.066	54	37.42	2.56
1878.....	48.29	.308	78	29.054	58	31.19	61.0
1879.....	46.68	.291	76	29.080	54	26.82	30.0
1880.....	47.32	.337	75	29.103	55	43.98	29.5
1881.....	47.83	.318	79	29.096	57	34.66	77.5
1882.....	47.57	.296	78	29.106	59	32.88	30.5
1883.....	43.51	.273	81	29.107	58	48.36	41.0
1884.....	45.66	.298	81	29.111	57	36.23	45.0
1885.....	42.90	.303	81	29.075	58	35.00	57.0
1886.....	46.20	.365	78	29.101	57	29.95	57.0
1887.....	46.60	.279	76	29.105	55	31.10	54.0
1888.....	45.03	.286	76	29.106	58	26.56	26.75
1889.....	47.43	.273	74	29.073	56	23.78	38.5
1890.....	47.61	.282	76	29.095	55	31.91	14.75
1891.....	47.40	.232	70	29.113	59	24.78	29.75
1892.....	45.88	.291	78	29.096	58	29.92	30.5
1893.....	44.97	.313	81	29.006	55	31.29	58.35
1894.....	48.5	.322	78	29.038	56	19.30	20.38
1895.....	46.67	.319	80	29.077	51	22.80	49.14
1896.....	47.99	.374	90	29.037	56	35.20	35.75
1897.....	47.01	.359	91	29.117	52	33.61	39.63
Means.....	46.56	.304	79	29.059	57	31.27	46.00

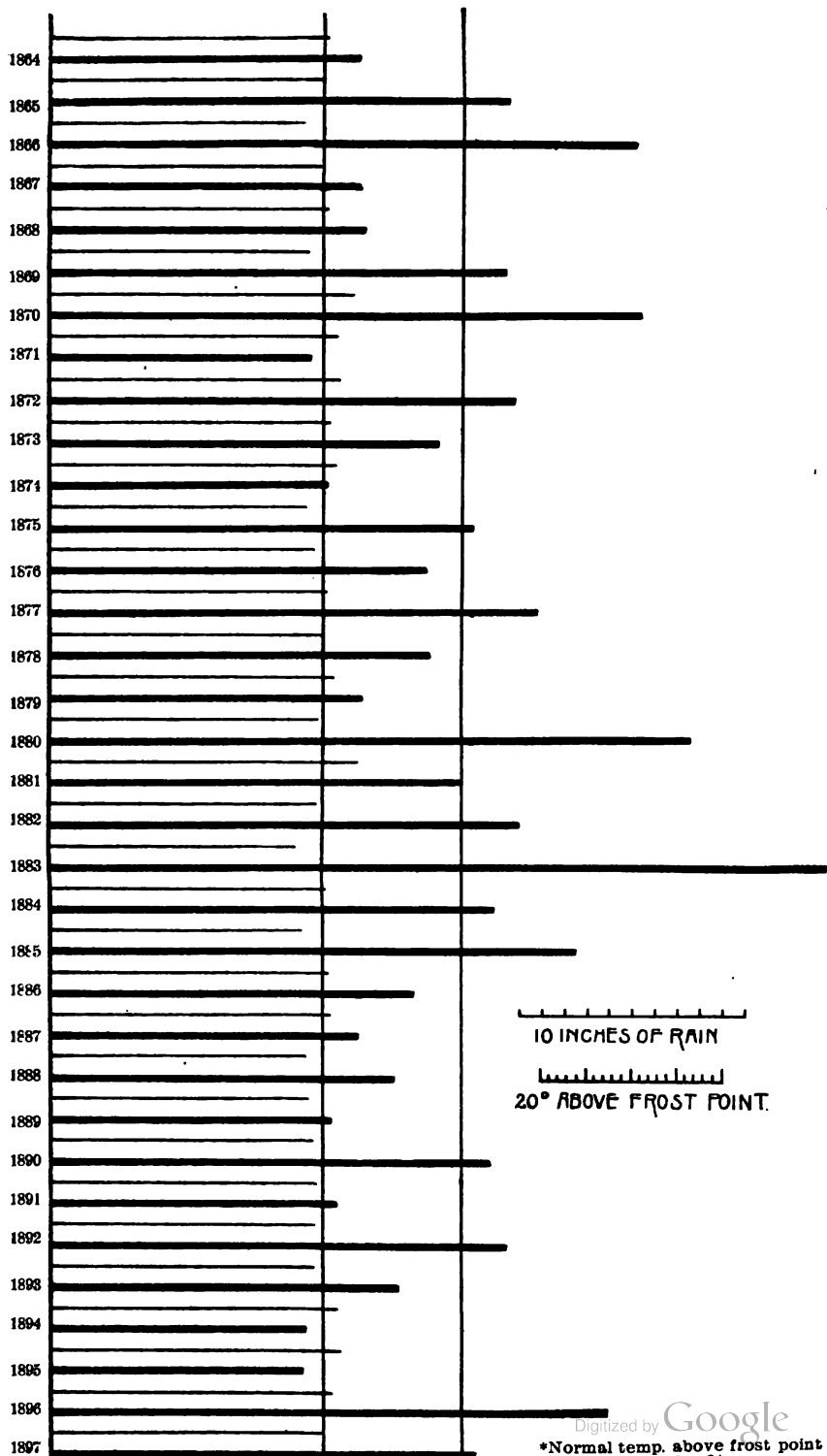
## THE ACTIVE SEASON OF GROWTH.

The period of active growth of trees in Michigan is the six months from May to October. The cold season both as regards temperature and precipitation of atmospheric moisture has a small influence on forest growth.

A table is here presented giving the mean rainfall in inches for the six months of each year, and the monthly temperature for the year.

Temperature and rainfall for May-October inclusive, years 1864 to 1897.

Years.	May.		June.		July.		August.		September.		October.		Average monthly temperature.	Total Rainfall.	Average monthly rainfall.
	Mean temperature.	Rainfall.	Mean temperature.	Rainfall.	Mean temperature.	Rainfall.	Mean temperature.	Rainfall.	Mean temperature.	Rainfall.	Mean temperature.	Rainfall.			
1864.	60.19	2.87	67.62	3.88	74.52	1.25	70.72	0.39	59.62	3.52	45.74	1.86	63.07	13.76	2.29
1865.	57.65	1.77	70.76	3.55	65.60	3.91	63.84	3.38	67.66	4.79	46.50	2.79	62.83	20.19	3.37
1866.	55.04	3.48	66.60	5.37	71.72	4.19	62.90	3.44	65.80	5.81	49.50	2.79	62.83	25.86	4.81
1867.	51.11	3.81	71.61	2.83	71.60	1.78	69.78	1.74	56.90	1.42	50.60	3.11	60.21	13.69	2.28
1868.	59.08	2.80	68.48	3.55	77.19	1.11	70.33	2.42	58.77	2.95	45.80	1.11	61.88	13.94	2.82
1869.	56.02	2.05	64.45	4.40	70.35	5.77	70.56	4.55	63.45	1.43	40.90	1.72	60.94	20.22	3.37
1870.	64.32	1.16	70.67	7.27	74.40	8.02	70.11	4.53	63.66	2.85	45.80	2.29	65.97	26.12	4.35
1871.	61.39	1.97	68.21	2.93	70.60	3.10	71.19	1.42	59.10	0.79	53.91	1.43	64.07	11.64	1.94
1872.	58.48	8.72	71.82	3.45	74.91	3.36	71.22	4.18	62.03	5.21	47.44	0.67	64.32	20.59	3.43
1873.	56.96	3.05	70.60	2.96	72.02	2.56	69.49	0.80	67.35	3.50	41.68	1.91	63.92	17.34	2.89
1874.	59.58	1.77	70.61	6.07	72.02	2.42	69.39	1.28	62.85	1.27	49.10	0.49	63.92	12.44	2.07
1875.	60.82	4.48	68.57	1.84	72.48	2.10	71.55	1.47	58.50	2.89	43.74	1.26	61.69	16.76	3.15
1876.	57.95	4.13	68.14	4.34	72.48	2.25	69.46	6.57	61.28	1.38	50.83	5.69	62.70	16.82	2.79
1877.	58.25	2.23	65.93	3.53	71.43	2.25	70.15	1.85	63.15	3.43	48.83	1.57	62.22	13.88	3.61
1878.	54.57	8.44	64.08	3.15	73.04	2.96	70.00	1.61	56.31	3.19	46.23	2.51	61.76	21.65	2.80
1879.	58.76	2.45	66.02	2.87	74.03	6.27	68.58	6.02	55.83	3.10	46.23	5.56	62.70	18.39	2.81
1880.	64.30	5.59	67.60	5.04	68.04	6.27	68.58	1.63	69.69	2.91	52.51	3.66	61.52	28.53	3.07
1881.	65.24	2.11	64.31	4.37	73.14	1.81	72.69	5.72	59.48	2.84	46.17	2.61	61.52	18.39	3.49
1882.	52.73	6.66	67.71	11.35	68.94	11.32	69.52	0.18	56.43	0.67	52.51	3.66	59.18	34.46	5.74
1883.	58.78	5.86	67.87	2.83	67.96	2.60	66.91	1.80	65.06	3.34	50.91	5.73	62.11	29.45	3.29
1884.	56.90	3.95	68.92	6.01	72.70	2.52	63.62	1.82	58.94	3.75	44.93	3.03	60.77	17.75	2.71
1885.	55.78	2.80	64.69	2.92	70.66	0.65	69.30	0.89	56.94	5.40	52.87	0.95	63.03	16.28	2.81
1886.	58.06	2.67	65.72	1.92	75.51	1.50	67.96	0.99	58.86	4.72	44.97	1.86	63.85	13.86	2.56
1887.	64.28	2.42	68.53	2.47	75.51	2.40	67.55	1.87	57.76	1.89	45.70	3.00	60.51	15.33	2.09
1888.	53.65	8.66	67.89	2.51	70.53	2.40	67.55	0.68	61.24	0.79	44.19	0.65	60.73	12.56	3.29
1889.	57.37	3.61	67.30	3.92	70.19	0.92	65.40	3.80	57.70	1.67	48.81	0.52	61.71	19.63	2.15
1890.	53.70	4.96	67.40	2.35	65.80	2.00	66.30	4.82	65.10	1.10	48.80	0.78	61.71	12.80	3.10
1891.	55.69	1.63	67.40	4.33	70.29	1.86	66.30	5.12	60.80	2.14	49.70	0.91	61.45	15.58	2.68
1892.	54.50	2.96	66.60	4.83	71.50	1.86	66.30	0.56	58.40	1.84	49.70	0.91	61.45	11.44	1.91
1893.	56.94	4.53	71.38	1.30	73.22	1.47	66.80	0.00	63.66	2.54	49.80	1.91	63.96	24.99	3.17
1894.	61.80	2.06	71.40	1.01	70.50	0.73	66.80	4.64	66.60	0.85	45.00	1.41	64.42	11.44	1.91
1895.	66.48	3.14	67.87	2.60	73.79	6.73	67.99	4.73	67.62	6.73	44.61	1.06	62.62	24.99	3.17
1896.	66.48	3.29	67.87	2.60	73.79	6.73	67.99	4.73	67.62	6.73	44.61	1.06	62.62	24.99	3.17
1897.	55.79	3.29	67.87	2.60	73.79	6.73	67.99	4.73	67.62	6.73	44.61	1.06	62.62	24.99	3.17
Means	57.96	3.23	67.77	3.52	71.39	3.27	65.89	2.80	60.91	2.79	48.18	2.42	62.45	18.31	3.03



## VARIABLE CLIMATE.

The climate of Michigan is subject to wide variations, especially in the rainfall. The average rainfall, including snow, is 31.27 inches at the Agricultural College, yet in 1894 the rainfall was only 19.3 inches, while in 1883 it was 48.36 inches. The fluctuations in temperature are less, the mean temperature being 46.56, yet in 1871 it was 49.90, while in 1873 it was 41.54 degrees, or more than eight degrees colder.

To enable one to see at a glance the fluctuations in rainfall, and in temperature above the frost point for the six growing months, from May to October, the following plate is inserted: The heavy black horizontal line denotes the relative amount of rainfall for the six months, while the vertical heavy black line shows the normal rainfall for the period: The light horizontal line shows the relative temperature above frost point for the six months of the year, and the light vertical line shows the normal temperature above frost point for the same period.

The changes from year to year in the amount of rainfall are so great as to be confusing in studying the weather. To equalize this in some degree and see whether our climate is changing, the results are recast in periods of five years, both in the annual rainfall and in that for six months of the active growing season.

Inches of mean rainfall by periods:	Year.	6 months.
1864 to 1868.....	31.70	17.67
1869 to 1873.....	31.34	19.18
1874 to 1878.....	31.88	17.23
1879 to 1883.....	37.34	23.24
1884 to 1888.....	31.78	17.34
1889 to 1893.....	28.34	18.22
1894 to 1897.....	27.73	18.73

## PROXIMITY TO THE GREAT LAKES.

The influence of the great lakes on the climate of neighboring land, especially when the prevailing winds blow from the water over the land, is recognized. To show the extent of this influence as far as possible, observations were consulted in the office of the State Weather Bureau, and by the kindness of Director Schneider, are here presented. They cover a period of ten years past, and embrace the mean temperature and rainfall for the six months—May to October:

	Temperature.	Rainfall.
Grand Haven, Ottawa Co.....	60.60	18.38
Hart, Oceana Co.....	60.71	17.06
Ivan, Kalkaska Co.....	59.40	17.33
Charlevoix, Charlevoix Co.....	59.39	16.83
Cheboygan, Cheboygan Co.....	57.45	18.00
Alpena, Alpena Co.....	56.63	19.89
Harrisville, Alcona Co.....	59.48	18.15
Jeddo, Sanilac Co.....	61.41	16.46
Port Huron, St. Clair Co.....	60.53	16.91
Grayling, Crawford Co.....	58.18	14.11
Ovid, Clinton Co.....	61.60	15.70
Alma, Gratiot Co.....	61.03	16.86
Flint, Genesee Co.....	60.90	13.84
Agricultural College, Ingham Co.....	61.13	16.31

A progressive fall in temperature is to be expected as we pass northward. The variation in the amount of rainfall for the active six months is a matter of interest. Note the rainfall at Ivan (17.33) at Grayling (14.11) and at Harrisville (18.15), all of them in the same tier of counties. Also at Grand Haven (18.38) at Ovid (15.70) at Flint (13.84) and at Port Huron (16.91)—all in the same tier of counties, reaching across the State from west to east.



## FORESTRY LEGISLATION.

CLINTON D. SMITH.

In Michigan, as early as 1846, a law was enacted (Howell's Annotated Statutes 9,402, 9,403 and 9,404) making it a misdemeanor to wilfully or negligently set fire to any woods, prairies or ground not the property of the person committing the deed, or wilfully or negligently permitting any fire to pass from his own woods, prairies or grounds, to the injury or destruction of the property of other persons. The maximum penalty is a fine of \$1,000 or imprisonment in the county jail not exceeding one year. The guilty person is also liable to the party injured in double the amount of the damages sustained.

"Whenever the woods or prairies of any township shall be on fire so as to endanger property, it shall be the duty of the justices of the peace, the supervisor, and the commissioner of highways of such township, and each of them, to order such, and so many of the inhabitants of such township, liable to work on the highways, and residing in the vicinity of the place where such fire shall be, as they shall severally deem necessary, to repair to the place where such fire shall prevail, and there to assist in extinguishing the same, or in stopping its progress. If any person shall refuse or wilfully neglect to comply with such order, he shall forfeit a sum not less than five nor more than fifty dollars."

An act, approved May 29, 1897, adds three more sections to these statutes, as follows:

Sec. 9404 a. (Sec. 4). "The township boards of the several townships of this State are hereby authorized, and it shall be their duty to prohibit the setting of forest fires or fires for the purpose of clearing lands, and disposing by burning, of refuse material and waste matter within their respective jurisdictions, whenever, in the judgment of a majority of the members of each of said boards, it shall be deemed necessary to prevent the spreading of such fires over the territory of such township, or any part thereof. Each of such boards may make such rules and regulations as it may deem proper for the purpose of carrying this act into effect, which rules and regulations shall be published by posting notices thereof, together with a copy of this act, in five of the most public places in such township."

Sec. 9404 b. (Sec. 5). "Whenever in pursuance of the authority hereby given, any township board shall designate a period during which it shall be unlawful to set such fires, any person who shall be found guilty of violating the order of such board by setting any such fire in such township contrary to the provisions of any section of this act, shall be deemed guilty of a misdemeanor, and on conviction thereof, shall be subject to the same punishment as is prescribed in section one of this chapter: Provided, That any person desiring to dispose of refuse material by burning the same during the time prohibited by the board of such township, may do so after first procuring permission in writing, signed by the supervisor and township clerk, or by a majority of such township board, and the said supervisor and township clerk, or a majority of the said board, are hereby authorized to grant such permission, in their discretion,

under such conditions as they may prescribe, upon application, made in writing, for such purpose; Provided, further, That said board is hereby authorized at any time to repeal by resolution any action theretofore taken by them under the provisions of this act."

Sec. 9404c. (Sec. 6) "Hereafter it shall be the duty of every person residing north of parallel forty-four of north latitude, before setting fire for any of the above mentioned purposes, to serve a notice in writing on every resident owner or occupant of lands or grounds immediately adjoining the tract upon which such fires are to be set, at least one full day previous to the setting of such fires, personally, or by leaving the same at the residence of such adjoining owner or occupant, in the presence of some member of the family of suitable age and discretion, who shall be informed of the contents, and neglecting to give such notice, shall be deemed prima facie evidence of negligence on the part of the person so offending."

The laws passed in 1857 in regard to trespassers on the public lands are still in force. They are found in sections 9405 to 9414 of Howell's Annotated Statutes. These sections declare it to be a felony to knowingly enter upon any of the public lands of this State to cut down or destroy trees growing thereon. If the value of the trees so cut down exceeds twenty-five dollars, the maximum penalty is fixed at five years' imprisonment at hard labor in the State Prison, or by fine not less than one hundred nor more than two thousand dollars. Whoever shall take away any timber or lumber from the State lands is deemed guilty of a felony, and upon conviction, is fined not less than a hundred nor more than two thousand dollars, and is also liable to imprisonment for not less than three nor more than twelve months, or imprisonment alone for not more than five years. If the value of the trees cut down or destroyed be less than twenty-five dollars, the punishment is fixed and may be either imprisonment not less than three months nor more than a year, or fine of not less than fifty nor more than one hundred dollars and imprisonment for a period not to exceed three months.

Whenever timber upon the public lands has been destroyed the prosecution of the supposed offender is begun by preliminary examination, had within the county where the alleged offense was committed: When the accused person is held for trial upon such preliminary examination, the subsequent proceedings may take place either in the county where the offense was committed or in some other county to which the venue is changed by the circuit court.

The law further provides that if any owner of a sawmill or his agent receives and saws logs knowing them to have been stolen from the public domain he shall be deemed guilty of a felony, and shall receive the same punishment as would have been inflicted had he been the original timber thief.

It is the duty of the prosecuting attorney of the county to promptly report to the Commissioner of the State Land Office all trespasses committed upon public lands in his county which may come to his knowledge, and it is his further duty when directed by the Commissioner both to prosecute all actions for trespass or injury to the public lands and to advise the Commissioner and give opinions upon all questions of law which the Commissioner may submit to him.

It is evident that the Michigan forests are not unprotected for lack of legislation. Existing statutes provide means both for preventing depre-



dations upon the public domain and for employing the inhabitants of the vicinity in suppressing forest fires. If the public lands are defenseless that condition arises rather from lack of enforcement of the law than from want of legislation. What is wanted in the communities surrounding the public lands is a public spirit which will convict offenders when found guilty, and will aid in the prevention of crimes against the public by making such offenders unpopular and retribution certain. One would hesitate long before recommending that the enforcement of the law be placed in the hands of State agents rather than local officers were it not that the experience of forestry management both in this State and elsewhere had demonstrated the necessity of such a course. The difficulty of enforcing a law for the protection of public property is too great to be left in the hands of local officers who have every temptation to favor the trespassers.

*In other states.*—The Division of Forestry of the United States Department of Agriculture, has brought together in circulars No. 13 and 17, the recent legislation on state forestry commissions and forest reserves.

The legislature of the state of New York passed in 1897 an act to provide for the acquisition of land in the territory embraced in the Adirondack Park and making an appropriation therefor. By the first section of the act the Governor of the state was directed to appoint from the Commissioners of Fisheries, Game and Forests, and the Commissioner of the State Land Office, three persons to constitute a board which is known as the Forest Preserve Board, the members of which receive no compensation except their actual and necessary expenses. The duties of the board relate to the acquisition for the state by purchase or otherwise, of such of the lands and waters embraced in the Adirondack Park as it may deem advisable for the interest of the state. The state is securing title to a large body of land already covered with timber and located at the head waters of its principal rivers. A portion of this land has been lumbered, it is true, but it is still well covered with young and growing timber.

Beginning on page 1 of chapter No. 17 of the United States Division of Forestry, there is the following epitome of the New York forestry law:

"The original forest commission of the state of New York appointed under the act of May 15, 1885, was superseded in 1895 by the Commission of Fisheries, Game and Forests, under the law of April 25, 1895. This law is a comprehensive measure in which allied interests are brought under the control of a single board. Under this law the commission consists of five members, appointed by the Governor, with the consent of the senate, the term of office being five years. The President, who is designated as such by the Governor, receives a salary of \$5,000 per year and traveling expenses, and devotes all of his time to the work of his office. The remaining four commissioners receive \$1,000 per year and traveling expenses. The board holds at least four meetings on designated days each year. It has a secretary at \$2,000 per year, and necessary clerical force. The duties of the board are to propagate and distribute food-fish and game; to enforce all laws for the protection of fish and game and for the protection and preservation of the forest reserve. It has full control of the Adirondack Park and forest reserve, and is authorized to make rules for its care and safety.

"The commission appoints thirty-five 'Fish and Game Protectors and Foresters' (hereafter called Foresters) one of whom to be known as chief,

and two others as his assistants, the chief to have the control and direction of the entire force. The Foresters give bonds for the proper discharge of their duties. The Chief Forester receive \$2,000 per year and traveling expenses; the assistant Foresters \$1,200 each, and the remaining Foresters \$500 each; all having an extra allowance for traveling expenses and each of them to receive one-half of all fines collected in actions brought upon information furnished by them. It is their duty to enforce all laws and regulations of the commission for the protection of fish and game and for the protection and preservation of the forest reserve and all rules and regulations for the care of the Adirondack Park. They have full power to execute all warrants and search warrants and to serve subpoenas."

"Article XII, chapter 395, laws of 1895, describes the forest preserve (Sec. 270), and defines the powers and duties of the commission (Sec. 271), whose duty it is (1) to have the care, custody, control, and superintendence of the forest preserve; (2) maintain, protect and promote the growth of the forest in the preserve; (3) have charge of the public interest of the state in regard to forests and tree planting, and especially with reference to forest fires in every part of the state; (4) possess all the powers relating to the preserve which were vested in the Commissioners of the Land Office and in the Comptroller on May 15, 1885; (5) prescribe rules and regulations affecting the whole or any part of the preserve for its use, care and administration, and alter or amend the same, but neither such rules or regulations nor anything contained in this article shall prevent or operate to prevent the free use of any roads, streams, or water as the same may have been heretofore used, or may be reasonably required in the prosecution of any lawful business; (6) take measures, for the awakening of an interest in forestry in the schools, and imparting elementary instruction on such subjects therein, and issue tracts and circulars for the care of private woodlands, etc.; (7) print and post rules for the prevention and suppression of forest fires."

By a law passed in April, 1898, a College of Forestry was founded at the Cornell University. Thirty thousand acres of land in the Adirondack Park are set aside for the use of this college as an experimental area. An annual appropriation supplies the college with sufficient funds.

The Minnesota forestry law is modeled after the laws of New York and Maine. All of these laws entrust the enforcement to some responsible officer. The chief features of the Minnesota law follow:

The law is entitled "An act to provide for the preservation of forests of this state, and for the prevention and suppression of forest and prairie fires."

Section 1, enacts that the State Auditor shall be forest commissioner. The supervisors of towns, mayors of cities and presidents of village councils are constituted fire wardens of their respective localities, but the chief fire warden may appoint such other persons as he may deem necessary as fire wardens in unorganized territory.

The sections following provide that the forest commissioner shall appoint a competent deputy to be known as chief fire warden, who is to receive a salary of twelve hundred dollars per year. He is a trained forester and it is his duty to enforce the provisions of the law. He has general charge of the fire warden force of the state and can mass it at any special point to suppress fires. He can appoint, temporarily, needed fire wardens in cases of large fires and divides into fire districts all un-

organized territories of the state and appoints competent fire wardens therein. He investigates the extent of the forests, the amount and varieties of timber, the damages done to them from time to time by forest fires, the causes of such fires, the methods used to promote the regrowth of timber and any other important facts relating to forest interests which may be required by the forest commissioner. He makes an annual report including the information so gathered and his suggestions.

It is made the duty of all fire wardens to post in conspicuous places in their respective districts warning placards containing abstracts of the forest law, rules and regulations that accord therewith as promulgated by the forest commissioner who furnishes the placards.

During the dry season when fires are liable to occur, the chief fire warden is authorized to use such means as he may deem necessary to prevent or suppress such fires at the expense of the state, but his expenditures in one year are not to exceed five thousand dollars.

It is the duty of the fire warden to take precautions to prevent the starting of forest or prairie fires and, when fire threatens, to go to the place of danger, to call to his assistance able-bodied men, and if any such person refuses to assist, or if the fire warden himself neglects to perform the duties assigned him, such officer or person is deemed guilty of a misdemeanor and upon conviction is punished by a fine of not more than a hundred dollars or by imprisonment for three months.

The chief fire warden and the local fire wardens are given authority to arrest without warrant any person violating the provisions of the act and to take the offender before a magistrate and make complaint against him. It is made the duty of the fire wardens to inquire into the cause of each forest or prairie fire within their district and to report the same to the chief fire warden, with the method used to control such fires, the amount of property destroyed, the number of lives lost and such other facts as the chief fire warden may require.

The fire wardens receive for actual services two dollars per day, two-thirds of which is paid by the county and one-third by the state. The other employees receive one dollar and fifty cents per day. It is provided, however, that no fire warden shall be paid in any one year for more than ten days service in extinguishing or preventing forest or prairie fires, nor for more than five days' services in posting notices and making reports. No county shall expend more than five hundred dollars of public money in any one year under this act.

Any person who wilfully or carelessly causes to be set on fire any woods or prairies by means whereof the property of another is injured, is guilty of a misdemeanor and upon conviction is punished by a fine not exceeding a hundred dollars or by imprisonment not exceeding three months. If the act is malicious, destroying property and endangering life, the maximum fine is \$500 and the imprisonment ten years. Any person who shall either kindle a fire dangerously near the forest or prairie lands and leave it unquenched, or who shall use other than incombustible wads for fire arms or who shall carry a naked torch or exposed light in or dangerously near forest land, or who shall wilfully or heedlessly deface or remove any warning placard posted as required by the act, is liable either to a fine not exceeding a hundred dollars or to three months' imprisonment.

The railroad companies are required to use efficient spark arresters on all their engines and to keep their right of way, for fifty feet each side

of the center, clear of all combustible material, between the fifteenth day of April and the first day of December. Deposits of fire, live coals or hot ashes are forbidden in the immediate vicinity of woodlands, and trainmen are required to report fires discovered along the line at the next telegraph station they may pass. The railroad companies are required to instruct their employees in the means for preventing and extinguishing fires and to post the warning placards furnished by the forest commissioner in their stations in the vicinity of forest and prairie grass lands. "Where a fire occurs along the line of their road they shall concentrate such help and adopt such measures as shall be available to effectively extinguish it."

The railroad company violating the requirements of the act is punished by a fine not exceeding a hundred dollars for each offense, the railroad employee violating the law is deemed guilty of a misdemeanor and is punished by a fine of not less than five dollars nor more than fifty.

It is made the duty of every owner of a threshing or portable steam engine to use efficient spark arresters and to put out or cover with three inches of earth any live coals or ashes which they shall deposit in any place from the engine.

The Forest Commissioner is required to make a written report to the Governor of his proceedings under this act annually, which report shall include such statistics and facts as he has obtained from the chief fire warden and other sources, with suggestions for the preservation of forests and the prevention and extinguishment of forest and prairie fires.

In the legislative session of 1897, in Minnesota, an important bill was introduced, passing the house but failing in the senate. Its purpose was to encourage the growing and preservation of forests and forest reserve areas. Among the novel features of the bill was a section providing that any person or corporation being the owner of any tract of land partly cut over or entirely so, which, however, would not probably be utilized for agricultural purposes for many years, might deed the same to the State of Minnesota, if in the judgment of the State Forestry Board the land should be received for forestry purposes. Lands deemed necessary for the preservation of water courses are specially mentioned in the act as tracts to be thus accepted. Provision was made for the distribution of the revenues accruing from such land, two-thirds to be paid to such public educational institution as the grantor in the deed might designate.

The Wisconsin law is similar in general character to the Minnesota law, except that the chief clerk of the State Land Office and his deputy are made State Forest Warden and Deputy Forest Warden, respectively, without additional salary.

The Maine laws make the State Land Agent the Forest Commissioner. The selectmen of towns are made fire wardens. Anyone who neglects to extinguish a camp fire is liable to a fine not exceeding \$100, or imprisonment in the county jail one month, or both. Railroad companies are required to burn or cut and remove all grass and debris from the right of way once a year, to use spark arresters on their locomotives, to refrain from depositing live coals, fire or ashes on their track, and to report fires along the right of way at their next telegraph station.

The Forest Commissioner encourages interest in forestry in the public schools and publishes circulars of information as to the care of woodlands.

Pennsylvania has a law, passed in 1895, and approved by the Governor, March 13, of that year, creating a Department of Agriculture, and charging it with the duty of caring for the forestry interests of the state. Section 3, of the law reads as follows:

Sec. 3. "That it shall be the duty of the Secretary to obtain and publish information respecting the extent and condition of the forest lands in this state, to make and carry out rules and regulations for the enforcement of all laws designed to protect forests from fires, and from all illegal depredations and destruction, and report the same annually to the Governor, and as far as practicable, to give information and advice respecting the best methods of preserving woodland and starting new plantations. He shall also, as far as practicable, procure statistics of the amount of timber cut during each year, the purposes for which it is used and the amount of timber land thus cleared as compared with the amount of land newly brought under timber cultivation, and shall in general adopt all such measures as, in his judgment, may be desirable and effective, for the preservation and increase of the timber lands, and shall have direct charge and control of the management of all forest lands belonging to the commonwealth, subject to the provisions of the law relative thereto."

The legislature of 1897 passed several additional acts, making the constables of townships *ex officio* fire wardens and authorizing them without a warrant to arrest persons reasonably suspected by them of offending against the laws protecting timber lands. The owner of any land in that state having on it forest or timber trees, not less than fifty trees to the acre, measuring at least eight inches in diameter six feet above the ground, with no portion of the land clear, shall receive a rebate of 80 per cent of the taxes assessed and paid upon such land as long as the trees are maintained in sound condition. Such rebate shall not exceed forty-five cents per acre.

It is made the duty of the Commissioner of Forestry to examine the location and character of lands advertised for sale for non-payment of taxes, and if he finds them so located and of such a character as to make them desirable for the purpose of a forestry reservation, he may purchase them at the tax sales, subject of course, to right of redemption, to become part of a forestry reservation system, having in view the preservation of the water supply at the sources of the rivers of the state and the protection of the people of the commonwealth and their property from destructive floods.

By the same legislature a commission was created to be composed of the Commissioner of Forestry, the Chairman of the State Board of Health, the Deputy Secretary of Internal Affairs, a lawyer or conveyancer of ten years' professional experience, and a practical surveyor. The duty of this commission is to locate and report to the legislature three forestry reservations selected from lands suited to the growth of trees rather than to mining or agriculture, and with an average altitude of not less than six hundred feet above the sea level. Each of these reservations is to consist of not less than forty thousand acres. One reservation is to be located upon the head waters of the Delaware river, another upon the head waters of the Susquehanna and the third upon those of the Ohio.

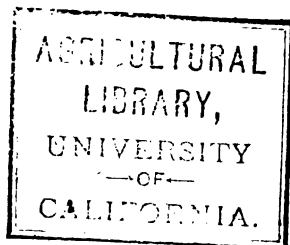
Upon several points the legislation, in the states adjacent to Michigan, seems to be in substantial accord. In each of them a state forest park of broad area has been reserved and is to be maintained. These forest tracts subserve several purposes, they are the laboratories in which ex-

periments aimed at the solution of forestry problems are tried; they are the equipment for forestry instruction to the people of the State who, unfortunately, are grossly ignorant of the fundamental principles of the sciences relating to tree growing; they are broad enough to conserve the moisture at the head waters of the rivers and allow it to percolate slowly through the soil, keeping up the flow of the rivers during periods of drought, and finally each is the nucleus about which shall spread larger forests, owned either by the State or by private individuals.

In the second place, the enforcement of laws against forest fires and for the protection of forests generally is placed in the hands of a trained and well organized department. The chief officer is either elected or appointed solely as a commissioner of forestry, devoting his whole time to the work, or the duties of some existing state official are enlarged to include the enforcement of the law, and a sufficient number of trained assistants are provided. It is evident that until the public conscience is awakened to the enormity of the crime of starting forest fires and the public intelligence is aroused to comprehend the financial losses which they entail, it is impossible to so far enforce the best laws as to control or prevent devastating conflagration. The efficacy of legislation depends largely upon supporting public opinion. It is made the duty of the forest commissioner, therefore, to educate public opinion through the public schools and by means of special circulars and reports.



**BULLETIN 163.**



**NOVEMBER, 1898.**

MICHIGAN

STATE AGRICULTURAL COLLEGE

EXPERIMENT STATION

HORTICULTURAL DEPARTMENT

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STRAWBERRY CULTURE

NOTES ON VARIETIES

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AGRICULTURAL COLLEGE, MICHIGAN  
1898





MICHIGAN  
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1898

*The Bulletins of this Station are sent free to all newspapers in the State and to such individuals interested in farming as may request them. Address all applications to the Secretary, Agricultural College, Michigan.*

# MICHIGAN AGRICULTURAL EXPERIMENT STATION

Postoffice and Telegraph Address, . . . . . Agricultural College, Mich.  
 Railroad and Express Address, . . . . . Lansing, Mich.

A DEPARTMENT OF THE STATE AGRICULTURAL COLLEGE, AND, WITH IT, CONTROLLED BY THE

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# STRAWBERRY CULTURE.

BY L. R. TAFT AND H. P. GLADDEN.

Letters are frequently received asking for information regarding the planting and care of strawberries, and believing that it will be of interest to many readers of the Bulletins, the following brief notes upon strawberry culture have been prepared.

For two or three years the price of these, as well as of other small fruits, has ruled quite low, but in cases where the berries were well grown, of large size and nicely packed, remunerative prices could usually be secured, while the poor or ordinary grades, in many cases hardly paid the cost of putting on the market.

Many growers are in the habit of setting the plants and giving fair care the first season, but the plants are allowed to layer so as to form a solid row of plants two or more feet wide. The result is that the plants are weak and the food and moisture furnished are insufficient to develop the large number of berries that are set. Although it is not generally practiced, many growers are in the habit of allowing the beds to fruit for six or eight years, and, as they become grown up to grass and weeds, poor fruit only can be expected.

While the hill system of culture cannot be generally recommended for all growers or with all varieties, under proper conditions the results obtained will be highly satisfactory, as the fruit will be of large size and will be produced in large quantities, but, the amount that will be obtained by the average grower from narrow matted rows will be larger from the same area than can be secured from hill culture.

We do not advocate commercial cultivation of strawberries except by those whose location is adapted to it, and who have the necessary information as to the best methods of handling the crops and the executive ability to grow and market them, but there are few persons who cannot have an area devoted to this crop, sufficient to supply fruit for their own table, and it is for such persons that the information here presented is particularly intended.

## THE SOIL AND ITS PREPARATION.

Whether or not it is for a market or home patch, the results secured will, in a general way, be measured by the adaptation of the soil. As the strawberry contains a large amount of water and ripens at a time when a drought may be expected, the location selected should, so far as possible, provide a soil that is at least fairly retentive of moisture. Equal care should be taken that it is so thoroughly drained, either naturally or artificially, that water will at no time stand upon the surface and that in a very short time after a rain, the level of the standing water will be at least two feet below the surface. It is commonly said that any good corn soil will answer for strawberries, but, while this is true, on account of the

much greater value of the crop, more care should be taken that it is in a proper physical condition and supplied with the needed amount of plant food.

As a rule, the lighter sandy loams should be avoided, as the crop will be likely to suffer from lack of water, while the stiff clays can seldom be properly worked in the spring, and if neglected are likely to bake so that the plants suffer more from the lack of water than upon the lighter sands.

In a general way, then, it will be seen that the heavier sandy loams and the lighter clay loams are best adapted for this crop, although good results will be obtained upon the lighter soils, if moisture can be provided. Fair returns are often obtained upon a soil of a mucky nature, as the water is generally so near the surface that droughts will have no effect, but two difficulties are frequently met with upon this class of soils, the first being the danger of frosts while the plants are in blossom, and the other that the plants make a rank growth and fail to form the necessary fruit buds. Where the mucky soil is in a basin, entirely or nearly surrounded by higher land, the blossoms seldom escape the frost, but if so situated that the cold air can drain off upon a lake, or still lower land, the danger will be lessened. After the land has been cropped for a number of years, the danger of the rank growth of plants will be greatly reduced, and if they are kept in hills, especially if a liberal amount of ground bone and ashes are used, a good crop of fruit can generally be expected upon this kind of soil and, as there will be but little danger from draught, the fruit will be large and will bring the highest price.

In the home garden it is frequently impossible to find soil adapted to the growing of small fruits, and it will often pay to go to considerable expense in improving the physical condition of the soil. Where the soil is of a heavy nature, it will often be possible to spread over the surface and mix with it an inch or more of sand or sandy loam; good results will also be secured by the use of fine coal ashes, either from hard or soft coal, and a liberal dressing of partially decomposed stable manure will also aid in loosening and lightening the soil. If the soil is of too light a nature and it is not possible to add clay or heavy loam, the use of muck or wood ashes will have a beneficial effect, the former supplying humus and the latter tending to render the soil more compact. A soil improved in this way will be in good condition for other crops.

To precede the strawberries, a heavy clover sod is desirable, as this can be turned under and will not only provide a large amount of plant food, but it will so add to the humus in the soil that there will be far less danger from drouth. Cow-peas will in most parts of the State make a fair growth, and where the ground is not needed for other crops can be grown and turned under previous to planting the strawberries.

Sod land is not desirable, as it is generally deficient in humus and plant food and frequently contains insect larvae, which may prove destructive to the plants. Almost any of the hoed crops may be used for one year previous to setting the plants and will leave the land in good condition for the strawberries, especially if it was heavily top-dressed with stable manure in the spring, or fall, previous to planting. Few soils will give the best results without the use of manure or fertilizer of some kind, and if the manure can be applied to the land at least one year before it is to be used for the strawberries it will decompose and will be in a suitable condition to yield up this plant food.

An application of fifteen to twenty loads of partially decomposed manure will be sufficient for most soils, but where wood ashes can be readily secured their use will be found profitable; fifty to one hundred bushels to the acre should be applied, after the land has been plowed, and worked into the soil when dragging.

For commercial plantations it will hardly be desirable to use chemical fertilizers, as, with clover and other green crops and the addition of manure and wood ashes, fertilizers will add but slightly to the yield, and the expense will not be returned in the crops; for the private garden, however, if the manure cannot be readily obtained, fertilizers may be used. A number of brands of fertilizers have been prepared by the different manufacturers, especially for the small fruits, and a thousand to fifteen hundred pounds per acre will give good results. For those who desire to prepare their own mixtures, however, we recommend one hundred pounds of nitrate of soda, eight hundred pounds of ground bone, and one hundred bushels of wood ashes, or, if these cannot be obtained, four hundred pounds of potash salts, either muriate or sulphate.

Although fall planting will give fair results under intensive culture, the best returns will ordinarily be secured from spring-set plants.

Unless the land is unusually heavy so that there will be danger of its puddling during the winter, it will be well to plow the land in the fall, and in the spring thoroughly pulverize the surface. With deep soil the furrows may be turned to the depth of seven or eight inches, but in a thin light soil, it will not be advisable to plow more than one-half inch deeper than the previous plowing. If the plowing was not done in the fall, it should be done in the spring as early as the ground can be worked and rolled to press the loose soils firmly down upon the under soil, in order that the upward movement of the water may not be checked. The dragging can hardly be too thorough, and especially if for any reason the plants cannot be set as soon as the land has been prepared, the working should be kept up, at least once a week.

In dragging the ground the disk or cutaway harrow may be used upon heavy ground, but ordinarily the Acme or springtooth harrow followed by a smoothing harrow or weeder will give good results. If the soil is at all cloddy, good results will be obtained with the use of clod crusher or roller.

In this way many of the small weeds which may start will be destroyed, and the labor of hoeing and cultivating during the season will be greatly lessened. The aid from this is so great that many growers purposely delay the putting out of the plants for several weeks on this account only. In the small gardens it will be advisable to have the strawberry plats so arranged as to allow the use of the plow, as it will do better work than the spade as ordinarily handled, and in much less time. Where the area is sufficient to permit the use of a horse, the land should be marked off at the proper intervals; these will vary with the method selected for the handling of plants. When the matted row is used the distance should be  $3\frac{1}{2}$  to 4 feet, the latter distance being preferred by many growers; but when the hill system of planting is used, the rows may be as close as  $2\frac{1}{2}$  or 3 feet, while some growers who expect to work the ground both ways, mark the land in squares of 2 feet.

## PLANTS AND PLANTING.

All strawberry growers are aware that it is only the plants formed by the runners that should be used for the new plantation; these have yellowish white roots, and can thus be distinguished from the older plants, which have a long stem at the lower end of which are black or brown roots (Fig. 1), many of which are dead or broken. If plants of good quality, which can be depended upon to give large crops, are desired, those selected for planting should have good crowns and well developed roots (Fig. 2). As



Fig. 2. STRONG YOUNG PLANT.



Fig. 1. OLD PLANT.

a rule only the first plants on the runners should be used. When the plants are allowed to layer freely a large number of weak sets (Fig. 3) are produced, and, although these will grow, they give a small yield and the practice, if persisted in, will result in the running out of the variety.

FIG. 3.  
WEAK TERMINAL PLANT.

The best plants can be secured from fields that have been grown but one year, and which have not as yet fruited. The practice of obtaining plants from old plantations, although used by many persons, is not a good one, as continued fruiting cannot fail to sap the vitality of the plants and the runners produced by them will not give as good results as those from young plants. Whatever method of digging the plants is used, whether by spade, fork or potato hook, care should be taken that they are not exposed to the drying action of the sun or wind, and as soon as dug they should be placed in baskets, boxes or bags, and after being moistened should be put where they can be kept fresh and prevented from wilting.

Dealers in strawberry plants, when picking up the plants after they have been dug, generally remove the dead or diseased leaves and runners, and at the same time straighten out the roots and the remaining leaves.

The plants are then tied in bundles or packed in baskets or boxes. Sometimes the operation of trimming and bunching the plants is not done in the field, as it is found easier to do this in a packing shed, or other place, where the work can be done in the shade and the danger of the wilting of the plants lessened. Even though one is merely digging a few plants for home use, the removal of the leaves and runners and the straightening out of the roots should not be neglected. Sometimes the setting of the plants is necessarily delayed until late in the season, when, if the air happens to be dry, there will be great danger of the wilting and perhaps the killing of the plants from the heat and dryness of the soil and air. Under these conditions it will be advisable to cut off the leaves except one or two of the smaller ones, as by thus reducing their surface the evaporation will be lessened. When plants have been purchased and have become dry or heated in the bundles, it will be advisable to untie the bundles and either place them in water up to the crowns in some cool shady place, or to heel them in, so that the soil will be in contact with roots of each plant, in moist soil where they can be shaded and occasionally sprinkled. In a few days the plants that have not been killed will recover, and it will be possible to throw out those that have been spoiled. In this way the labor of planting will be lessened and there will be no vacant places in the rows from the use of injured plants.

While it will not be best to pursue this course when large areas are to be set, any one having only a small plantation will find it advisable to put out the plants when the condition of the soil and atmosphere favor their growth. If they can be set just before a shower, or as soon as the ground is in suitable condition afterwards, their growth will generally be assured. Some go so far as to recommend the digging of the plants in the early morning, keeping them in a cool, moist cellar until late in the afternoon and then putting them out. Where this can be done there is undoubtedly a benefit from it, as the plants will contain much more moisture in the morning than when they have been exposed to the heat of the sun during the day, and by planting them in the early evening they will be less likely to wilt the following day than when the planting is done in the morning.

When the plants are being set, equal care should be taken that the roots are not exposed. If the soil has been so worked that a dust mulch has been provided, the soil that will be in contact with the roots will ordinarily have a sufficient amount of moisture, and watering will not be necessary, but, should the soil be dry, a pint or so of water should be given each plant before the planting has been completed; this will permit of the drawing of dry soil about it after the water has soaked in, and the baking of the soil about the plant, which otherwise might happen, will be prevented. In setting the plants a spade, dibble or trowel may be used, and if the work is properly done there will be little difference in the result secured. When the dibble or spade is used, a cut is made in the ground to the depth of 6 or 8 inches, and the soil is pressed back in either direction by a side movement of the handle; in the opening thus formed the roots are placed, care being taken that they are not cramped and that they are so spread out that the soil can be brought in contact with each of them. When large plants, with a thick mat of roots are used, this is particularly necessary, as otherwise the soil would only be in contact with a layer of roots upon the outside of this bundle and the inner roots will become dry and the plant will wilt. There is also considerable danger of loss if at-



tention is not given to the depth at which the plants are set; they should be at such a depth that the bud will be just above the surface (Fig. 4 c), as if deeper than this there will be danger that, especially on heavy soil, the bud cannot make its way through the soil (Fig. 4 b), while if not deep enough (Fig. 4 a) a part of the roots will be exposed and the plant will be



Fig. 4. DEPTHS FOR PLANTING; a, too shallow; b, too deep; c, just right.

very likely to dry out. If placed, perhaps, a quarter or half inch deeper than it grows in the field, this will be sufficient to allow for the settling of the plant and will leave it in about the right position. In planting with the trowel the same method may be used as with the dibble or spade, but with a few plants many think it will pay to take somewhat more pains with the planting; a large hole is dug and in the bottom of this a conical elevation is left, around and upon which the roots are spread.

After placing the plants at the right depth, the soil is pressed against them with the dibble, or hands, so that it will be in close contact with the roots, and the success of the planting will be increased if the feet are used to assist in packing the soil; pressure upon one side will generally suffice, but if the soil is sandy a foot may be placed at either side of the plant. The continued and repeated pressure with the feet about the plant, as practiced by some, is not advisable.

When the mound system of planting is used, the soil is drawn into the hole with the trowel and is firmed about the plant with the hands and feet. Some persons object to the use of the dibble in planting strawberries, and their objections can be well-sustained against the ordinary round dibble, or pointed stick, but the form used by most planters consists of a flat piece of steel or wood, 3 or 4 inches wide and nearly a foot long, which is pointed and with thin edges and provided with a D-shaped handle; with this a broad opening, something like that formed with a spade can be made and into this the roots can be spread. A man accustomed to the use of this tool will set nearly as many plants in well prepared soil, as two men when spades are used.

The distance between plants will depend somewhat upon the variety and also upon the method of cultivation. For the matted-row system, with varieties that are common, and that do not make many runners, the distance may be from 12 to 18 inches, but with new and choice varieties and such kinds as layer freely, intervals may be increased to two or even three feet. In hills, however, some growers, as mentioned above, set the plants two feet each way, while others have the rows three feet apart and the plants 12 to 15 inches apart in the rows.

Where the plants are in a small garden in which the cultivation is by hand, many prefer to grow the plants in beds. The plants are set about one foot each way and are kept in hills; four or five rows are grown and then a space of two or two and one-half feet is left for a walk, beyond which other beds are planted in a similar manner. With rich, moist soil this method gives excellent results in a small garden.

#### THE FALL PLANTING OF STRAWBERRIES.

Although not to be generally recommended, the fall planting of strawberries can sometimes be used with good results, but in order to succeed, special pains must be taken both with the soil and plants. In the states farther south, where the seasons of growth will be considerably longer, this method of growing strawberries is preferred to planting in the spring. In seasons when the weather is moist during August and September, very good results can be obtained in Michigan, but if drought prevails there is danger of a check to the plants, and this will result disastrously. Upon soil that will not suffer seriously from drought, or where water can be applied, the fall setting will give good results. As the season of growth will be comparatively short at best, the soil should be thoroughly prepared and enriched. In order to promote a rapid growth the use of a small amount of some soluble fertilizer rich in nitrogen will be advisable. The plants should be of some strong growing variety that will furnish large crowns and that are adapted to hill culture, and only the strongest and best should be selected. It will be advisable to use either pot plants, or to take the best runners that form, and set them close together in some spot where they can be shaded and watered. If placed about four inches apart each way they will develop strong roots, and when the ground has been properly prepared, they can be transplanted with but little check to their growth. The soil in which they are started should be of such a nature that they can be taken up with a ball of earth upon their roots. Unless water for irrigation is at hand, the planting should be delayed until the ground has been well moistened by rain, but if possible the planting should be done before the first of September. Good results, however, can be secured if the plants are set out by the middle of September. The rows should be from 2 to 2½ feet apart and the plants ten inches in the rows. Even though the ground has been well enriched, it will be advisable to mulch the plants by spreading decomposed manure along each side of the rows. Under these conditions a good growth will be secured and the plants will make strong crowns before winter. The ground should be occasionally worked during the fall and up to the time of freezing weather, so that it will be entirely free from weeds. The ground should then be mulched, and in the spring receive a shallow cultivation. It will be desirable to replace the mulch before the blossoms have opened, and unless the winter mulch is sufficient to cover the ground so as to keep down the weeds and conserve the moisture, an additional amount should be employed.

This method of strawberry culture is not recommended for the general planter, but for the amateur and for the home garden, especially where the starting of a new plantation was neglected in the spring, it certainly is worthy of trial. However, as stated in the beginning, good results

should not be expected, except under the most intensive cultivation and where the growth of the plants is not allowed to be checked. As the plants are grown in hills, the fruit will be of large size, and where an increased price can be obtained for fine fruit, the results will be satisfactory for market purposes.

#### VARIETIES.

In selecting kinds for home use it is always desirable to include a sufficient number to provide a succession throughout the season, and there will be less occasion to consider firmness among the qualities to be desired than when they are grown for market purposes, but even more attention should be given to the flavor. While the hardiness and productiveness of the plants will always be the most important consideration, this characteristic even may be slightly sacrificed to produce varieties of high quality; regularity of form and a pleasing color will be desirable whether the varieties are for home use or market, and while the size should at least be medium, for home use, varieties that grow a large or very large sized berry will bring the most money for market varieties. As a rule, the very large sorts are less regular in form and of inferior quality to the varieties that are medium sized.

The accompanying report upon the varieties grown by this department last season gives lists that have been thoroughly tested in various parts of the State, and will be found generally adapted to the purpose for which they are recommended. Each year a large number of varieties are introduced which may have shown valuable characteristics upon the grounds of the originators, but comparatively few seem to be adapted to general cultivation, and for this reason we do not recommend the extensive planting of new kinds.

A few years ago the very early varieties generally brought a good price and it was found profitable to place these kinds upon a warm soil in order to hasten the maturity, but in recent years the southern berries have been brought in so freely that the price is little, if any, higher than can be obtained later in the season, and as the extremely early sorts are less productive than later kinds, their use in market plantations has for the most part been given up, except in sections where the southern berries have not found their way. Especially in the middle and northern part of the State the planting of late kinds has been found quite profitable, as they could not only be shipped to the south where they would bring a good price, as there will be no local competition, but shipments to points in Northern Michigan and in Minnesota also brought good returns.

By the proper selection of soil and location a considerable range of season can be secured, as early kinds upon a light soil and southern exposure will be hastened in ripening, while late sorts upon a heavy soil with a northern slope will be somewhat retarded and a season covering four or five weeks can sometimes be secured in this way.

## PERFECT AND IMPERFECT FLOWERED VARIETIES.

The flowers of many varieties of strawberries possess no stamens, and, if these kinds are planted by themselves, the fruit produced will be small, irregular and of no value; these varieties are commonly spoken of as pistillate, or imperfect flowered (Fig. 5). There are also a large number of varieties that in addition to the pistils, have more or less small stamens, but, as the amount of pollen they produce is small, it will be best to depend upon perfect-flowered kinds (Fig. 6) to fertilize them. In some

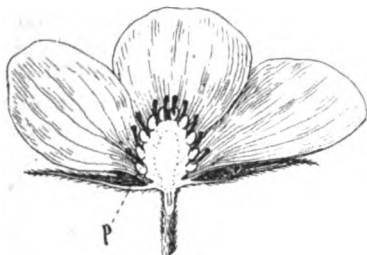


Fig. 5. IMPERFECT STRAWBERRY BLOSSOM; p, pistils.



Fig. 6. PERFECT STRAWBERRY BLOSSOM; p, pistils; s, stamens; p and s do. magnified.

seasons they may develop all that will be required, but in others some varieties may produce an amount so small that it will not suffice to fertilize the pistils. Aside from the fact that varying amounts of pollen are produced by different varieties and that in the same variety it changes from year to year, it also happens that the amount required for the proper fertilization of the ovules varies in different years, as when the weather is warm and pleasant a much smaller quantity will suffice than when it is cold and wet. Still other varieties have a considerable number of strong stamens that produce large amounts of pollen, and if the pistillate, or nearly pistillate kinds are grown, it will be advisable to have at least every fifth row of these strong staminate kinds that flower at the same time. Some growers living in sections near the lakes where the air is moist, and where fogs prevail, find that in order to secure perfect fertilization of pistillate varieties, it is well to have every third row of some variety that produces a large amount of pollen.

While it does not hold true in all cases, careful examination of the list of productive varieties of strawberries will show that imperfect-flowered kinds are as a rule rather more productive than those with perfect flowers, which has been ascribed to the fact that the staminate kinds have exhausted themselves, in part at least, in the production of the pollen, and are consequently able to develop but a comparatively small amount of fruit. However, as the rule does not hold true in all cases, the merits of the individual varieties should be considered in making the selection.

## CULTIVATION AND CARE.

Unless rains fall immediately after the plants are set, the cultivator should be started, and from this time until the middle of August, the

land should be worked at least once a week whenever it is in a suitable condition; if the season is dry two or three times a week would not be too much. Especially if the soil is heavy and the season moist the cultivation during the spring may be comparatively deep, but within a very few weeks the roots will have so extended themselves that they will occupy the entire space between the rows, and if the deep cultivation is continued, the roots will be injured and the growth of the plants checked. Ordinarily if the ground is worked to the depth of  $1\frac{1}{2}$  or 2 inches after the first month, the best results will be secured, as it will be amply deep to destroy the weeds and conserve moisture, and it will not injure the roots. While cultivators with somewhat wider shovels may be used during the spring, after the weather becomes dry those with spike or, at least, very narrow teeth, should be used. Some have recommended the use of weeders for cultivating strawberries, but while they get over the ground quickly and leave it in an excellent condition, they loosen many of the plants, even though they do not break them off, and it is not advisable to run them over rows. However, when the land has been carefully marked and the plants set in straight rows, weeders can often be used with good results, by first removing such of the teeth as would touch the plants, and when weeders are made with removable wings they can be so narrowed down that they will work between the rows, and then form an excellent substitute for cultivators.

The ideal method of cultivating strawberries is to have the land at all times in about the condition it would be if worked with a garden rake, and this can only be secured when tools with narrow teeth are used. If the soil is inclined to bake, it will often be advisable to break the crust that forms about the plants after a rain, and during the season it should not be neglected whenever necessary to keep down the weeds and prevent the formation of a crust. As a substitute for the hoe, a light potato hook is recommended, as this can be used to work closely about the plants without danger of injuring them, and will leave the surface in better condition than the hoe.

During the first season the plants should not be allowed to bear fruit, and as soon as the blossom stalks are large enough to permit of its being done readily, they should be broken or cut out. Where the plants start to form layers in large numbers, early in the season, it will be advisable to remove them. This may be done with a hoe, or with some of the cutters made for the purpose. The rolling cutters that are attached to a cultivator frame will remove some of the runners, but do not do it thoroughly, and their use is seldom satisfactory.

After the middle of July plants that are to be grown in matted rows are allowed to layer, and ordinarily no attention is paid to assisting them, but if the season is very dry, and few runners are formed they may be layered by hand. Some growers also find it advisable to layer the plants by hand, and thus distribute them so that the ground will be occupied to the best advantage. When the plants are two feet apart, two runners are layered at either side of each original plant, so that they will form a square with the old plant in the center. The other runners are removed and the plants are allowed to thicken up and give nearly as good results as can be obtained from hill culture.

The growers who plant so as to work the ground both ways, and still wish to grow the plants in matted rows, are only able to keep up this prac-

tice until about the middle of July, and after that work the land in one direction only. In this way the runners are distributed lengthwise of the rows, where they soon become layered. It will generally be best to restrict the width of the row to eight or ten inches.

The care of plants to be grown in hills will be much the same except that throughout the season all runners are cut off as soon as they appear, and as a result a number of crowns will be formed by each plant and the plants will so thicken up that they will occupy a space a foot or more in diameter.

#### MULCHING.

Especially upon land where the plants are likely to be heaved by its freezing and thawing during the winter, the use of a mulch will be advisable, and for the hill plants it should seldom be dispensed with upon any soil. On light soils there will be comparatively little injury to plants grown in matted rows, and the use of a mulch as a winter protection will not be necessary, although if material can be readily secured, its use even then will be advisable. It will generally be best to defer the spreading of the mulch until the ground is frozen. The materials used may be such as can be readily secured and that are free from the seeds of grass, weeds, etc. If it can be obtained, a mulch of marsh hay will be desirable, but straw answers very well. Where forest leaves can be easily secured they may be used between the rows of plants, but are not advisable upon them, as they pack down too closely. If they are used, a thin covering of straw will be necessary to hold them in place and to cover the plants. Where the land has not been properly enriched, some think it advisable to put on a liberal dressing of stable manure, which will also answer as a mulch. This should be thoroughly decomposed, as otherwise there will be trouble from the growth of seeds of grass and clover. Corn stalks also make a clean mulch, but are rather unsightly. The amount of mulch that should be used, should depend somewhat upon the method of handling the plantation the following summer. If the ground is not to be cultivated before the crop is gathered, the covering should be thicker than when cultivation is to be given. When the mulching material is abundant, it may be used to the depth of three or four inches, except over the plants, where it should be only thick enough to merely cover them. A mulch of this thickness will not only prevent winter injury, but it will serve to keep the weeds down during the summer, as well as to hold the moisture. If the land is to be worked in the spring, a depth of two inches or barely enough to prevent injury from freezing will be sufficient. Some growers who are able to secure a good price for their fruit late in the season, use an extra thickness of mulch in order to delay the fruiting period. By planting upon a hillside sloping to the north, and by leaving the plants covered as late in the spring as possible, considerable difference may be secured. However, care must be taken not to leave the mulch over the plants too late, as they start into growth under the mulch, and the blanched tender shoots are easily injured, either by frost or by the sun, when uncovered. It is often recommended to apply a heavy mulch and leave it on in the spring to defer the starting of the plants, and thus render them less likely to be injured by the frost, but except upon a north slope there is great danger of the late and thick covering doing more harm than good.

Ordinarily it will be found desirable to remove the mulch directly over the plants as soon as growth has started. If the ground is not to be cultivated this may be placed between the rows and allowed to remain undisturbed until the crop has been gathered. Oftentimes if just the right thickness of mulch has been used over the plants, it need not be disturbed at all, as the plants will find their way through it, and the mulch will both aid in keeping the weeds down and prevent the baking of the soil among the plants. If the field was kept free from weeds the first season, they should give little trouble previous to the ripening of the fruit, but if any large weeds appear, they should be pulled or cut out.

Where a mulch is not used, and especially if the land has not been properly treated the first year, it sometimes becomes necessary to work the ground in the spring in order to keep it free from weeds. If this becomes necessary, the cultivation should be given as early as possible, and should not be kept up after the plants are in blossom. Where the hill plants have not been mulched there will be even greater necessity for spring cultivation. Some growers dispense entirely with the mulch, but even though it is not used in the fall, the best fruit will only be secured when the plants are mulched, and if they are not mulched in the winter, it should be applied in the spring before the fruit has set. It will not only keep the berries clean, but it will be of great value in conserving moisture if the season is dry. Many growers who mulch in the fall find it advisable to cultivate their plants, however, in the spring and to do this the mulch must be taken off and again replaced after the cultivation has been given. By throwing four or five rows together it can be done with but little labor.

#### PREVENTING INJURY FROM FROST.

Although Jack Frost is continually showing freaks, the injury that is done to the blossoms can be greatly lessened if proper care is taken to secure a location with thorough air drainage, which can be best obtained on an elevated rolling site. While this is quite essential in the interior of the state, less attention need be paid to it near the lake shores and along rivers. When the air is well charged with vapor the injury from frost is greatly reduced, and where water is available, a crop often be saved, which would otherwise be destroyed, by sprinkling the plants just at night, or, better yet, very early in the morning, when the temperature drops to 32 degrees. With a supply of hose and an ordinary lawn sprinkler a considerable area can be covered. When the plants have been mulched during the winter, this material may be placed over the plants when a frost is expected, and if the temperature does not drop too low, the blossoms can thus be saved, but if the frosts continue for a number of days there is a probability, that unless the covering is removed during the day, the plants will be softened, and when the covering is finally taken off the danger of injury will be increased.

While many attempt to delay the blooming of the varieties in order that the danger of frosts might be lessened, by leaving on the winter covering late in the spring, a few have gone even farther and have covered the plants with a thick layer of ice, a covering of straw being placed over this to delay the melting of the ice, and as a result the blooming, as well as the ripening period, will be somewhat later.

Where one has large areas and water for irrigating or sprinkling is not at hand, a smudge of some kind may be used that will make a thick smoke. This will settle over the beds and prevent the radiation of heat, and lessen the danger from frost. Upon still nights, when the danger of frost is the greatest, the most marked results can be secured. While various materials have been burned to produce the smudge, the best results have been obtained from piles of straw over which coal tar has been poured. While they should be closer together on small areas, the distance between the piles need not be less than 75 or 100 feet for a field of a number of acres. If the materials are prepared and distributed when frosts are to be expected, it will be a simple matter to fire them about two o'clock in the morning. If at that time a thermometer near the ground in the field shows a temperature of 37 degrees, or less, and if the conditions seem to favor its dropping still lower, it will be advisable to fire them.

#### IRRIGATION.

There are few locations where strawberries are not each year more or less injured by lack of moisture in the soil, and where water can be readily secured for irrigating purposes, the expense of applying it will be well repaid. Oftentimes a single application made when the fruit is about one-half grown will double the yield, and occasionally a crop will be saved, which would otherwise be lost. Although its use is of less value during the first season's growth, it will often be found desirable when the weather is dry, to make an application in order to promote the growth of the plants. Some growers have received good returns where water has been pumped by windmills, steam or gasoline engines, but few would care to go to that expense. However, there are some locations where water can be taken from a stream and turned upon the land, and there will be no question but what irrigating can be made to pay. The water should be carried in furrows between the rows, and applied in sufficient quantities to cover the surface to a depth of one inch, which will require about eight hundred barrels per acre. It is in the home garden, however, where irrigation can be used to the best advantage in Michigan; as the water supply for the house or barn can generally be used for irrigating. If sufficient pressure can be secured, it will be best to make use of lawn sprinklers, which can be moved over the beds so as to thoroughly wet down the soil. If the land is thoroughly mulched a single watering will last for several days, and perhaps will be all that will be required. If the needed pressure cannot be secured, and particularly if the water supply is limited, it will be advisable to make use of sub-irrigation. By placing a line of drain tile below the surface, a strip from ten to twenty feet can be watered. If to be left permanently the line should at least be below the reach of the plow, and in case the land requires under-draining, the tile may be so arranged as to answer for both purposes. The depth should then be not less than  $2\frac{1}{2}$  feet, and the tile should be laid as nearly level as possible, and yet give a fall towards the outlet. When required for irrigating, the lower end of the tile can be closed and the drains flooded from the highest point. If merely needed for the strawberry crop, a temporary system of tiles may be laid. If put in before the plants are set, they should be covered at least four or five inches to be below the reach of the cultivator, but oftentimes the necessity is not recognized until about the time the fruit is ripening,



and then it will be sufficient if the tiles are barely covered. Care should be taken to have the lines of tile practically level for lengths of less than one hundred feet, and beyond this the slope should be very slight. Where the tiles have a greater slope the water rushes to the lower end and breaks through to the surface. When properly arranged the water should enter the tile only as fast as it soaks through the joints. In this way the tiles will be kept full and the water will be very equally distributed throughout the length of the tile. While smaller or larger sizes might be used, a three-inch common drain tile will give the best results. As most tiles are slightly curved in burning, by placing them with their rounded sides uppermost, a small crack will be left on the under side of each joint, and if care is taken that these openings are of about the same size, the water will be very evenly distributed. When the plants are set in narrow beds, a single line of tile along the center will suffice, but the best results will be secured if the water is not required to spread more than six or eight feet each way, although upon some soil a much wider distribution can be obtained. Several lines of tile may be connected so that they can all be filled from one point, but ordinarily the best results will be secured if the lines are independent, and each is filled from the highest point. A very small stream of water through a garden hose will supply a line one to two hundred feet in length, and after having adjusted the flow, it will require no attention until the ground has been thoroughly wet down. As the water will be applied beneath the surface there will be much less loss from evaporation, than when furrows are used and consequently it will be more economical of water, and will permit the covering of a considerable area through a small supply pipe with but little attention. Under the same conditions the use of furrows would not give nearly as even distribution and would require constant attention.

#### CLEANING OUT THE OLD BEDS.

As a rule when the beds have been well cared for and are free from grass and weeds, it will be advisable to keep them for a second crop. Especially if the plants have been attacked by insects or fungi, good results will be obtained from burning over the beds. To do this it will be necessary to have a supply of dry material, but the mulch will generally provide a sufficient amount. In order that the old strawberry leaves may be burned, a mowing machine should be run over the beds a day or two before the burning is to be done, and if there is a large amount of mulch that has become packed closely together, it should be loosened with a hay tedder or fork, as otherwise it will burn so slowly that there will be danger of its injuring the crowns of the plants, and if the amount is very large a part of it should be removed. The amount that is required is the least that will suffice to induce the fire to run over the entire bed. While a high wind will not be necessary, or desirable, the burning should be done when there is at least a gentle breeze that will carry the flames over the bed. Upon a still day there is danger that it will burn so slowly as to injure the plants.

In cleaning out the weeds and surplus plants, the use of a plow will be advisable, if the space permits. Furrows should be run upon each side of the rows, throwing the soil away from the plants so as to leave strips four or five inches wide. By means of a hoe the plants should be cut

away so as to leave one of the young plants for each foot of the row; grass and weeds should at the same time be cut out. If the land is not fertilized, decomposed manure or commercial fertilizers may be scattered along the rows and the furrows worked down with a cultivator.

For the rest of the season, the care should be the same as for a young plantation, and by winter young plants will have formed so that it will have much the same appearance as a bed set in the spring. While some growers allow the beds to fruit for a third year, the results will, as a rule, not be as satisfactory, as will be obtained from young plantations. On the other hand some varieties like Gandy do not get fairly established the first season, and the second and third crops will be larger than the first.

#### INSECTS AND DISEASES.

Ordinarily the strawberry is comparatively free from the attack of insects, and little attention need be given to them. When the plants are set upon recently plowed sod land, there is danger from white grubs and cut worms, but if, as is commonly practiced, strawberries are not placed upon land that has had sod upon it within less than two years, there will be little loss from this source.

Where cut worms are troublesome, they can generally be destroyed, if after fitting the land for the strawberries, freshly cut clover that has been soaked or sprayed with Paris green, or arsenic water is scattered in small bunches at intervals of six or eight feet each way.

For two or three years injury has been reported from the work of the strawberry leaf-roller in various parts of the state. The larvae of these insects draw the leaves about them and feed upon the foliage, causing it to turn brown and become dry. Late in June they enter the pupa state, from which they emerge as moths in about ten days and deposit eggs for a second brood. The second brood of the larvae attain maturity the last of September or the first of October, but do not appear as perfect insects until the following spring.

After the insects have drawn the leaves about themselves it is difficult to reach them with any application, but in sections where trouble is feared from these insects in new plantations, the plants should be thoroughly sprayed with Paris green or arsenic about the middle of June, and the applications should be repeated once in ten days up to the middle of July. The Paris green should be used at the rate of one pound in 150 gallons of water, and lime should be added to prevent injury to the foliage, and to hold the poison so that it will not be washed off by rains. If in spite of the spraying it is found that the insects have passed into the pupa form, the leaves should be picked off if the numbers are not great, or a heavy roller may be passed over them. Although this will not destroy all of the insects, it will crush large numbers of them. About the first of September before the second brood is hatched, another application of the poison should be made, and followed by two or three more at intervals of ten days. Frequent repetition of the spraying is necessary, as new leaves are constantly appearing, and if they are not covered with the poison the insects which feed upon them will escape to start a new brood. It will not be safe to use the poison during the fruiting season of the second year, but as soon as the crop has been harvested steps should be taken to destroy the larvae, whether the plants are to be kept for a third

year or not. This can be done by the thorough burning of the leaves as recommended above. Some persons have thought that if the plantations are not to be kept for another year it would suffice to plow up the bed, but this is not sufficient to destroy the larvae, and many of them would complete their development and come forth as moths to deposit their eggs upon neighboring plantations. In September when there is danger of a second brood, the plants should be sprayed as recommended for the first year.

The treatment above recommended is, of course, rather expensive, but in sections where the leaf roller has become as numerous as it is in various parts of Southern Michigan, something of the kind must be done if a crop is to be secured, and especially if the insects have not previously appeared in a section, but are found upon plants that have just been purchased, the danger of injury is so great that a considerable expense would be warranted in exterminating them. When plants are purchased they should be carefully examined, and if leaves that contain small larvae or chrysalides are found, they should be carefully picked off and burned, and the plants dipped into Paris green for a length of time sufficient to permit it to penetrate to all parts.

#### THE STRAWBERRY WEEVIL.

Although not generally common, a small insect known as the strawberry weevil has done considerable injury in some sections by feeding upon the pollen of perfect flowered varieties, thus not only preventing them from fruiting, but rendering the fruit of the imperfect-flowered kinds of no value. In sections where the weevil is at work the strawberries will need attention while in bud, or the crop will be a failure. M. Nelson of Menominee, Michigan, who has been considerably troubled with these insects, has invented a machine for the burning of sulphur and blowing the fumes upon the plants, and finds it a sure remedy. Of the ordinary remedies nothing will be found of more value than Paris green and lime water sprayed over the plants, but in order to have the treatment effectual, a second application at the end of three or four days will be advisable. The application of the water should be made before the buds open, as it will be of little use against the larvae. The perfect insect deposits its eggs inside of the flowers before they open, and then punctures and cuts the flower stems so that they drop to the ground. The flowers remain closed and the larvae developing inside feed upon the pollen. Care should be taken not to apply poisons after the fruit has set. While in some cases there is undoubtedly considerable benefit from the poison, it is likely that the lime sprayed over the plants acts as a deterrent, and has perhaps an even greater benefit than the poison. In the case of varieties that are injured by the leaf blight, Bordeaux mixture should be substituted for the lime, as is a fungicide, and will both serve to destroy insects and prevent the spread of the disease.

#### THE STRAWBERRY LEAF BLIGHT.

While subject to the attack of but few diseases, nearly all varieties of strawberries are more or less injured by the fungous disease commonly

known as strawberry rust or leaf blight. This attacks, not only the leaves, but the fruit stalks and the calyx, or husk, about the berries, and the injury is then so severe that the crop fails to ripen. It appears first as a purplish spot upon the leaves, but as this enlarges the center becomes brown, and finally white. If these spots are numerous upon the leaves, the tissue finally dries out and the entire leaf will be destroyed. The injury is even more severe when upon the fruit stems, as a very small spot will be sufficient to girdle them, and the shrivelling and drying of the fruit will follow.

There is a marked difference in the susceptibility of the different varieties to attack by this disease, and in selecting varieties for planting those that are the least subject to attack should be chosen. Some of the kinds that when free from a disease are very productive, become almost worthless when the conditions favor the development of the fungus. When grown under conditions that favor a normal growth, and when they are not subjected to a check, even the kinds that are most subject to injury frequently escape. Experiments have frequently shown that all varieties can be kept practically free from the attack of this disease if properly sprayed with Bordeaux mixture. In setting out a new plantation care should be taken to obtain plants that are practically free from disease, and all leaves that show signs of an attack should be removed and burned. As there may be spores of the disease upon the remaining leaves, it will be well to dip the plants into Bordeaux mixture, and after they have been set in the field, after a week or ten days, they should receive a spraying with the same material. One or two other applications at intervals of two weeks will also be advisable, and still another should be made about the first of August in case diseased leaves can be found at that time. The following spring the plants should be sprayed as soon as growth has started, and a second application should be made after the flower buds have formed, but before they open. As noted above, the use of Bordeaux mixture at this time will have a marked effect against the strawberry weevil, especially if Paris green is added. This treatment will ordinarily carry through the varieties that are most subject to the attack of leaf blight without serious injury. If the plantation is to be kept for another year, it will be well to burn it over, and to spray as soon as the new leaves have formed.

#### A BACTERIAL DISEASE OF THE STRAWBERRY.

Although it does not cause much trouble in Michigan, we have received a number of specimens of plant affected with some form of bacterial disease. These were from soils that had been enriched with nitrogenous fertilizers and contained a large amount of humus, and the diseased condition appeared after periods of warm, moist weather. The conditions under which the disease proves troublesome will point out the preventive remedies, but if the disease makes its appearance in a plantation, it will be well to at once remove and burn the affected plants. Care should be taken in putting out a new plantation to obtain healthy plants. Land in which the disease has appeared should not again be used for strawberries within several years.

## NOTES ON VARIETIES.

For a number of years this department has issued bulletins, giving the results of its trials with a large number of strawberries. An attempt has been made to keep the collection as complete as possible by the addition each year of the new varieties that are placed upon the market. We have also attempted to secure all new and promising seedings from the originators before ever placed upon the market in order that the public might be informed as to their value. Comparatively few of the sorts thus obtained have been deemed worthy of general introduction, and after trying them two or three years they have been dropped from our lists. Such varieties as seem to have merits that will make them worthy of planting, either for home use or for market, have been retained and if especially worthy have been put out in numbers sufficient to afford a thorough test. In order that we might be still better informed as to the value of the varieties for planting in different parts of the State, we have each year selected a number of kinds that are highly recommended and that to us seem to have some merit, and have sent a dozen plants of each kind to fruit growers in different parts of the State. In selecting these an endeavor has been made to place the plants in the hands of parties who will give them at least ordinary good care, who will note the results and report upon the varieties after they have fruited. While many of the kinds thus sent out have shown no valuable characteristics, others have given excellent satisfaction and as a result of the distribution we have not only assured ourselves of the value of the varieties, but have distributed the plants. In the tests that have been made at the Station we have endeavored so far as possible to put the plants under about the same conditions that they would find when in the hands of ordinary growers. Our soil is but poorly adapted to fruit culture, and varieties that succeed here should do even better in commercial plantations. The land that we have used has been fairly well manured with stable manure. This has been applied broadcast in the fall and turned under. In the spring, after the land has been properly fitted, it has been marked into rows  $3\frac{1}{2}$  feet apart and the plants are set at intervals of eighteen inches. Twenty-four plants of each variety are used, as a rule, although when the new kinds are sent to us for trial the number received is frequently only twelve. In order to test the merits of the different kinds under hill and matted row culture, we have cut the runners from twelve of the plants and have allowed them to form narrow rows upon the others. The plants had ordinary good care during the season, were mulched in the fall and the weeds that appeared during the spring were cut out, without disturbing the mulch except to remove it from over the plants.

Notes are taken of the dates of blossoming and ripening of the different varieties, as well as upon the vigor of the plants, their productiveness, and the size, shape, color and firmness of the fruit. In the following table these characteristics have been indicated. Instead of writing it out in full, abbreviations are used, the meaning of which is given at the head of the table. In the text that follows will be found descriptions, first, of the varieties that have been fruited but one season. This is followed by

a description of the varieties that were fruited first in 1897, few of which have been commonly tested. At the end will be found descriptions of some of the older and better known kinds. In the summary of the varieties, short lists of some of the more promising new varieties and others that include the better of the old kinds are given.

## STRAWBERRIES.

## ABBREVIATIONS.

Form. Size. Sex. Color.  
 b. broad. l. long. s. small. p. pistillate or imperfect. b. bright. l. light.  
 c. conical. o. oval. m. medium. b. bisexual or perfect. c. crimson. r. red.  
 d. depressed. r. round. l. large. d. dark. s. scarlet.  
 i. irregular.

Variety.	Sex.	Vigor (1-10.)	Date of bloom.	First ripe fruits.	Last fruits.	Productiveness.	Size.	Form.	Color.	Quality.	Firmness.
Anna Kennedy.....	p	8.8	May 24	June 10	June 22	6.5	m l	rc	bs	9	9
Annie Laurie.....	b	9	" 24	" 5	" 21	6	m l	rc	bs	9.8	9.5
Apache.....	b	10	" 19	" 4	" 20	1.8	m	lc	ls	5	8
Arkansas Traveler.....	b	6.5	" 24	" 6	" 23	8	l	rc	dc	8.8	8.5
Aroma.....	b	9.2	" 24	" 9	" 25	8.5	l	lc	ls	8	9.5
Arrow.....	p	8.8	" 22	" 4	" 23	8.5	m l	lc	lc	9.5	8.5
Avery.....	p	8	" 22	" 10	" 24	9.5	m	lc	bds	9.5	7.5
Beder Nord.....	b	8.8	" 21	" 9	" 22	9	m	r	lc	8	8.5
Beebe.....	p	8.5	" 21	" 11	" 27	7.8	m l	rc	e	9	8.5
Belle.....	b	8	" 19	" 9	" 25	8	m l	lc	bs	8	9
Bird.....	p	7.2	" 20	" 9	" 26	7.5	l	lc	bds	9	9.2
Blisel.....	b	7.5	" 21	" 10	" 23	7.5	m	bc	bc	9	9
Bismarck.....	b	8.8	" 22	" 9	" 25	9	l	rc	dc	8	8
Blonde.....	b	9.4	" 22	" 10	" 24	8.2	m	rc	lr	8	7.5
Bostonian.....	b	9.5	" 21	" 10	" 25	7.5	m l	rc	bs	9.8	9
Brandywine.....	b	9.7	" 21	" 9	" 25	9	l	rc	bdc	9.5	8.5
Bryant.....	b	9	" 20	" 10	" 26	9.5	l	bc	bdc	7	9.5
Bubach.....	p	9.4	" 21	" 9	" 25	8.8	l	dc	lc	9	8
Burnett.....	b	7	" 24	" 10	" 26	8	l	rc	bc	9.5	8.2
Canada Wilson.....	b	9	" 19	" 7	" 21	8	s	rc	vdc	8	9.5
Carrie.....	p	8.5	" 19	" 7	" 24	8.5	l	lc	dc	7.8	9.2
Cherokee.....	p	8.8	" 20	"	" 24	8	m	rc	e	9	8.5
Childs.....	b	8	" 22	" 7	" 22	7	l	dc	bc	9.5	9
Clyde.....	b	9.4	" 21	" 9	" 24	9	l	rc	ls	9	8.5
Cobden Queen.....	p	9.8	" 20	" 7	" 23	9.2	l	rdc	ls	7.8	7
Columbus.....	b	8.5	" 20	" 7	" 25	7	l	rc	bs	8.5	8.5
Crescent.....	p	9	" 20	" 7	" 22	9	m	rc	ls	8	8.5
Cyclone.....	b	8.8	" 20	" 3	" 22	5	m	lc	dc	9	9

## STRAWBERRIES.—CONTINUED.

Variety.	Sex.	Vigor (1-10).	Date of bloom.	First ripe fruits.	Last fruits.	Productiveness.	Size.	Form.	Color.	Quality.	Firmness.
Dakota.....	b	9.2	May 19	June 6	June 25	9	s	lc	ds	9	7
Dictator.....	p	5	" 21	" 9	" 24	4	m	rc	r	7.5	8.5
Dollar.....	b	9	" 20	" 9	" 24	8.8	l	lc	bs	9.2	9
Earliest.....	b	9.2	" 21	" 2	" 21	6.5	m	rc		7.5	7
Early Bird.....	b	8	" 20	" 8	" 21	4	s	l	lc	7.5	8
Early Jack.....	b	9.8	" 19	" 6	" 21	8.2	sm	l	ds	7	7
Edith.....	p	5	" 23	" 12	" 26	5	m	lbc	dc	9	9.5
Enhance.....	b	9	" 22	" 11	" 26	8	m	irc	ds	9	9
Enormous.....	p	7.5	" 22	" 6	" 21	7.5	l	l	dc	9	9
Epping.....	p	8.8	" 22	" 8	" 23	9	l	rdc	ls	8	9
Equinox.....	b	8	" 22	" 6	" 23	5	s	dc	c	8	8.5
Evans.....	b	9.5	" 21	" 8	" 23	7.5	ml	rc		9	7.5
Fountain.....	b	9.7	" 22	" 7	" 24	9.4	l	bc	vbc	9	9.2
Fremont.....	b	9.6	" 21	" 8	" 26	9.5	ml	lc	bs	9	8.8
Gandy.....	b	9.2	" 24	" 12	" 28	8.8	l	bc	lc	8.5	8.5
Gardner.....	b	8	" 19	" 9	" 26	9.7	l	bc	bc	8	8.5
Gen. Fifer.....	b	9	" 21	" 10	" 26	8.5	m	rc	br	9	8
Gertrude.....	b	8.5	" 21	" 6	" 23	4	sm	bc	ls	8	8.5
Giant.....	b	8.8	" 19	" 7	" 22	9.5	l	rc	dc	9.8	9.5
Glen Mary.....	b	9.4	" 21	" 8	" 24	9.5	l	c	bs	9	9
Graham.....	b	8.8	" 20	" 8	" 22	9	m	rc	dc	9.2	8
Granville.....	b	8.5	" 21	" 10	" 25	8	l	rdc	dc	9	8
Greenville.....	p	9.5	" 22	" 9	" 26	9	l	rdc	bc	8.5	7.5
Hall Favorite.....	b	6	" 24	" 9	" 25	8	ml	dc	dc	8.8	8.5
Hatch Exp. Station.....	b	7	" 21	" 9	" 23	9	l	rc	dc	9.5	8.5
Haverland.....	p	9.5	" 20	" 8	" 23	9	m	lc	s	8.5	8.5
Herbst.....	b	8.7	" 22	" 11	" 26	8.5	m	lc	vdc	7.5	9.5
Hersey.....	b	8	" 24	" 7	" 22	8.5	s	rc	vdc	9.5	8
Hilton Gem.....	b	9.8	" 22	" 8	" 23	9.2	l	lc	bds	9	8.8
Holland.....	p	9.5	" 26	" 8	" 23	8	m	lbc	dc	9	9
Homestead.....	b	9.2	" 22	" 7	" 21	9.2	s	l	rc	9.8	7
Hood River.....	b	8.5	" 23	" 8	" 23	9	m	rc	bc	9.7	9
Hoosier.....	b	9.7	" 20	" 10	" 24	9.8	l	lc	dc	9.5	9.5
Howell No. 2.....	b	8	" 21	" 10	" 25	8.5	l	lc	bdc	9.5	9
Hull No. 3.....	b	8.5	" 22	" 7	" 23	7	m	dc	ls	9	7
Ideal.....	b	9.6	" 22	" 8	" 24	9.2	ml	rc	bc	9	9
Iowa Beauty.....	b	9.5	" 20	" 7	" 25	8	m	rc	dc	9.5	8.5

## STRAWBERRIES.—CONTINUED.

Variety.	Sex.	Vigor (1-10).	Date of bloom.	First ripe fruits.	Last fruits.	Productiveness.	Size.	Form.	Color.	Quality.	Firmness.
Jarbalo.....	b	9.7	May 24	June 7	June 22	7.5	ml	rc	dc	7.5	8.5
Jerry Rusk.....	b	8	" 19	" 7	" 24	8	m	rc	bs	9	9
Kansas.....	b	9.2	" 20	" 7	" 21	9	m	rc	dc	9.5	8.5
Karl.....	b	10	" 21	" 7	" 24	6	s	l	dc	6	6
King Worthy.....	b	8.8	" 23	" 9	" 23	8	l	rc	ds	8	7.5
Knight.....	b	9.7	" 23	" 10	" 26	9.4	l	rc	bds	9.5	9.2
Kossuth.....	b	9.3	" 20	" 7	" 24	8.8	m	rbc	dc	9.2	9
Kyle No. 1.....	b	9.6	" 24	" 9	" 25	7	m	rc	ls	6	6
Lenah.....	b	9.3	" 24	" 9	" 21	9	m	c	ls	8.5	9.4
Laxton No. 1.....	b	8	" 21	" 7	" 22	7	sm	rc	ds	8.5	8
Leroy.....	p	9.4	" 19	" 7	" 22	9.4	l	dc	dc	9	9
Little No. 7.....	b	9.8	" 20	" 6	" 22	8.5	m	rc	ds	8.5	8.8
Little No. 8.....	b	8.8	" 22	" 9	" 24	7	m	bc	dc	9.5	9
Little No. 40.....	p	9.2	" 21	" 10	" 26	9.6	l	bc	bc	9	9
Lovett.....	b	8	" 23	" 7	" 23	7	m	rc	bc	8	9
Luther.....	b	7	" 20	" 3	" 19	7	m	rc	dc	8.5	8.8
Manwell.....	b	8.8	" 21	" 10	" 21	9.5	l	bc	dc	9.2	9
Marshall.....	b	9.4	" 22	" 7	" 24	9	l	rc	dc	8.5	9
Marston.....	p	9	" 23	" 7	" 24	8.5	m	rdo	lr	7	8.8
Mary.....	p	9	" 20	" 10	" 26	7.5	l	bdc	bc	7	9
Maumee.....	b	9.8	" 21	" 7	" 24	9.2	l	rc	bs	7.8	7.5
Maxwell.....	b	8.8	" 20	" 7	" 25	8	m	rc	dc	8	9
Mayflower.....	b	9.8	" 20	" 2	" 20	8.5	m	lrc	bs	8	8
McKinley.....	b	8	" 20	" 6	" 25	9	m	lc	dc	9.4	9
Meridian.....	p	9.1	" 21	" 6	" 26	9.5	m	rc	dc	7.5	8
Michigan.....	b	9	" 23	" 16	July 5	8.5	l	bc	bc	9.8	9.8
Mineola.....	b	8.5	" 21	" 8	June 26	4	m	rc	ds	7.5	7.5
Morgan Favorite.....	b	9.6	" 21	" 7	" 24	9.5	l	rc	bc	9.8	9.2
Nan.....	b	8.8	" 22	" 7	" 24	8	m	rc	lc	9.2	9
No. 15 W.....	b	8	" 23	" 7	" 21	5	m	rc	ls	8	7
No. 1,000.....	p	9.2	" 23	" 10	" 25	8	l	bc	bdc	9	9
No Name.....	b	8.2	" 22	" 7	" 21	6	l	bc	dc	9	9
Omega.....	p	8.4	" 22	" 10	" 26	8.5	l	rc	vdc	9.2	9
Ona.....	p	8.8	" 22	" 7	" 24	7.5	s	rc	bds	9.8	8.5
Oriole.....	p	8	" 23	" 8	" 23	8	m	rc	bs	9	9
Orono.....	p	9	" 19	" 10	" 26	9.5	s	rc	vdc	8.5	9
Oscar.....	b	9.8	" 19	" 4	" 22	8	l	rc	bc	8.5	8



## STRAWBERRIES—CONTINUED.

Variety.	Sex	Vigor (1-10).	Date of bloom.	First ripe fruits.	Last fruits.	Productiveness.	Size.	Form.	Color.	Quality.	Firmness.
Ostego.....	p	7	May 24	June 7	June 24	7	m	r d c	ls	8	8
Paris King.....	b	8.5	" 19	" 7	" 21	9	m	c	ds	8.5	8.5
Parker Earle.....	b	9	" 23	" 10	" 27	8.5	m	dc	ds	8	9
Patrick.....	b	8	" 19	" 7	" 24	9.5	s	bc	ls	8	9.4
Peabody.....	b	9.2	" 20	" 8	" 25	8.8	m	bc	bs	7.8	7.5
Pet.....	b	7.5	" 22	" 9	" 26	9	ml	bc	bds	9.2	9
Phlippen.....	b	9.2	" 20	" 7	" 23	7	m	lc	bc	8.8	9
Flow City.....	b	8.5	" 22	" 9	" 25	9	m	lc	bs	9	8.5
Pride of Cumberland.....	b	9	" 21	" 9	" 25	7.5	m	rc	bs	8	7.8
Princeton Chief.....	p	9.5	" 23	" 12	" 26	9.2	l	lc	dc	8.5	8.8
Portage.....	b	9.4	" 21	" 10	" 26	9	l	lc	bs	8	9
Purdue.....	p	8.5	" 24	" 7	" 27	9.5	l	rc	ds	8.5	9
Quality.....	b	5	" 24	" 10	" 25	-----	l	rc	bc	10	8.8
Richmond.....	b	8.8	" 24	" 8	" 27	9	l	bc	dc	9.5	8.5
Ridgeway.....	b	9.5	" 20	" 9	" 26	9.4	l	rc	bc	9	8.5
Rio.....	b	9	" 22	" 6	" 25	7	m	lc	bs	9	8.5
Robinson.....	b	9	" 20	" 10	" 25	9	m	rc	bc	7	8
Ruby.....	p	9	" 22	" 11	" 26	9.4	l	r d c	br	9.5	9.5
Satisfaction.....	b	8.8	" 21	" 8	" 24	8	s m	lc	bdc	9.8	8.8
Seaford.....	p	-----	" 21	" 8	" 26	-----	l	bc	dc	9.8	8.8
Sherman.....	b	9.5	" 21	" 7	" 23	9.5	l	rc	dc	8.5	9
Shyster.....	p	9.6	" 20	" 5	" 20	9	l	bc	bbs	8	8
Smalley.....	p	8.8	" 22	" 7	" 24	8	m	rc	dc	7.5	9.8
Smith.....	b	9	" 22	" 4	" 21	8	s m	rc	r	8	8
Snowball.....	b	9.6	" 22	" 6	" 25	8	m	lc	bs	8.5	9
Sparta.....	b	9.8	" 20	" 7	" 24	7.5	s m	lc	dc	9.5	9.5
Splendid.....	b	9	" 22	" 9	" 25	9	m	dc	ds	9	9
Stahelin.....	p	9.5	" 21	" 8	" 26	9.2	l	rc	vdc	9.5	8
Staples.....	b	8	" 21	" 5	" 21	7.5	s	lc	vdc	9	8.5
Star.....	b	9.5	" 21	" 12	" 27	7.5	l	bc	bs	9	8
Stevenson.....	p	6	" 21	" 6	" 24	4	s	rc	dc	9.5	8
Stewart.....	b	9.4	" 23	" 4	" 22	8.5	s.m	dc	dc	8	9.2
Stone.....	p	9.8	" 20	" 4	" 20	9	ml	lc	bs	8.8	8
Sunnyside.....	p	8.8	" 22	" 10	" 26	7.5	l	rc	ls	8.5	8
Sunrise.....	p	9	" 22	" 9	" 24	8	s m	rc	bs	8.5	8.5
Tennessee.....	b	9.8	" 20	" 7	" 25	9	l	rc	dc	9.5	9
Tennyson.....	b	8	" 24	" 9	" 24	7	m	rc	ls	9.5	8

## STRAWBERRIES.—CONCLUDED.

Variety.	Sex.	Vigor (1-10).	Date of bloom.	First ripe fruits.	Last fruits.	Productiveness.	Size.	Form.	Color.	Quality.	Firmness.
Thompson No. 40.....	p	9.6	" 21	" 10	" 26	9.5	m	rc	b c	8.5	8.5
Thompson No. 64.....	p	9	" 20	" 7	" 25	9.3	ml	irc	bds	8.5	9
Thompson No. 66.....	p	8.8	" 20	" 10	" 26	9.8	m	rdc	bdc	9.4	9.8
Thompson No. 108.....	b	8.5	" 21	" 9	" 24	8.7	l	rc	vbc	9	9
Timbrell.....	p	8.8	" 22	" 11	" 28	8.5	l	rc	vdc	9	8
Tonga.....	p	9.2	" 23	" 9	" 24	9.1	m	irc	s	8	9
Topeka.....	b	8.5	" 20	" 8	" 24	7.5	ml	lc	dc	8	8.5
Tubbs.....	b	8.8	" 21	" 7	" 22	8	m	rc	bc	9	7.5
Unnamed.....	b	9.8	" 22	" 12	" 27	9.2	vl	bic	bds	9.4	8.8
Warfield.....	p	9.5	" 20	" 6	" 23	9.4	m	lc	dc	8.5	9
Weston.....	p	8	" 22	" 8	" 23	9	l	bc	bc	8	8.5
Wetzel.....	b	9.4	" 24	" 9	" 24	7	ml	rc	ls	8	7.5
Whitney.....	b	9.1	" 22	" 10	" 25	5	l	l	bs	8.5	8
Wm. Belt.....	b	9.8	" 22	" 10	" 27	9.5	l	lc	lc	8.5	9
Woolverton.....	b	8.5	" 22	" 10	" 26	9.2	m	lc	dc	8	9
World's Champion.....	p	8.8	" 20	" 7	" 24	8.5	m	bc	dc	7.8	8
Wyatt.....	b	9.6	" 22	" 9	" 25	7.8	m	rc	dc	9.5	8.5
Yates.....	b	9.8	" 21	" 7	" 20	5	l	rbc	ls	9	7
Zula.....	b	7.5	" 19	" 7	" 20	7	s	ls	dbc	8.5	8.5

The following are new sorts, fruiting here for the first time during the past season:

*Arkansas Traveler*.—Plants received from Columbian Grape Co., Kingston, Ohio. Perfect flower. The variety seems lacking in vigor and in plant making qualities. The berries are large in size, round or broad conical form and of a bright, dark crimson color; quite attractive in appearance. The flesh is light, juicy, of fair quality and moderately firm. The fruit truss is short and most of the berries lie on the ground. Further trial may show the variety to be of more vigorous growth.

*Avery*.—Received from Matthew Crowford, Cuyahoga Falls, Ohio. Imperfect flower. Many of the plants failed to grow and those remaining are not strong. The fruit is of medium size, long pointed or broadly conical in shape and of a bright dark scarlet color. The flesh is dark, juicy, of high quality but not very firm. The plant and fruit closely resemble Haverland. The variety bore a large crop of fruit for the plant growth.

*Bismarck*.—From C. N. Flansburgh, Leslie, Mich. Perfect flower. The plants are of rather small, low growth. Berries very large, short, round conical form, color, dark crimson. The flesh is dark, of fair quality and moderate firmness. The plants did not form many blossoms but all the fruits were uniformly large. A promising variety to grow under high culture for large fancy fruits.

*Bryant*.—Plants from Birdseye & Son, Middle Hope, N. Y. Perfect flower. The plants are of strong, healthy growth. Berries large in size, round or broad conical, often irregular in shape, bright dark crimson color, handsome in appearance. The flesh is dark, lacking in juice, rather poor in quality, but firm. The variety ranks high in productiveness, and the attractive appearance of the fruit, together with its firmness, should make it valuable as a market berry.

*Burnett*.—Received from Thompson's Sons, Rio Vista, Va. Perfect flower. The plants are of rather weak growth. Berries large, short, round conical form, color bright crimson. The flesh is dark, not juicy but of high quality. Plants too weak to judge the variety.

*Canada Wilson*. Plants received from Birdseye & Son. Perfect flower. The berries are very firm, of good form and appearance, but are too small to make the variety valuable for market purposes.

*Carrie*.—Plants from Thompson's Sons. Imperfect flower. Medium in plant growth. Berries large, conical in form, and of a dull dark crimson. The flesh is dark, somewhat salvy and lacking in quality, while the long form is objectionable in a market sort.

*Cobden Queen*.—Plants from Columbian Grape Co. Imperfect flower. The plants are very strong and healthy. Berries large, round or depressed conical, very regular in form and of a light scarlet. The flesh is usually light colored. As grown here the berries are often hollow and lack quality and firmness. The variety made an excellent showing in hill culture.

*Dollar*.—Plants received from E. J. Hull, Olyphant, Pa. Perfect flower. The plants are of a good healthy growth, but do not make plants freely. Berries large, usually long conical in form, and light bright scarlet in color. Flesh bright, juicy, of good quality and firm. Promising in the size, handsome appearance and quality of the berry, but scarcely productive enough to rank high as a market sort.

*Evans*.—From Thompson's Sons. Perfect flower. Plants are strong and healthy in growth. The berries are usually large, round conical in form and of a light scarlet color. The flesh is light and lacks juice, but of good quality. The berries are too light in color and rather soft, and the plants are unproductive.

*Fountain*.—Plants from Slaymaker & Son, Dover, Delaware. Perfect flower. Berries large in size, broad conical, very regular and even in form. The color is a very bright dark crimson. The flesh is dark, juicy and of good quality. The plants are productive and the attractive appearance of the fruit, combined with its good form, high quality and firmness, make it one of the most promising sorts grown here this season.

*Hall Favorite*.—Received from L. J. Farmer, Pulaski, N. Y. Perfect flower. Plants are lacking in vigor of growth. Promising in berry, but the plant growth was too weak to properly judge the variety. Further trial is necessary.

*Hatch Experiment Station*.—Plants are of weak growth and make very few runners. Berries very large, sharp-pointed conical in form and of a dark crimson color. The flesh is dark, and while not juicy is of high quality and moderately firm. In size, form and quality of berry it ranks high. The color of the fruit is dull. The variety was very productive for the amount of plant growth.

*Herbst*.—Plants from J. L. Herbst, Sparta, Wis. Perfect flower. Plants of medium growth in matted rows, but quite strong in hills. Berries of medium size, large flattened conical in form and of very dark crimson color. The flesh is dark, juicy and quite acid. The fruits are firm enough to stand shipment well and are of good color; they ripen unevenly and the under side is green when the top is well colored.

*Hilton Gem*.—Received from L. J. Farmer. Perfect flower. The plants are of strong, healthy growth, and quite productive. Fruits large, long or round conical in form, and of a bright dark scarlet. The flesh is bright, juicy, of good quality and moderately firm. The fruits ripen somewhat unevenly, but are of good appearance, and while the variety has some merit, it is not worthy of special prominence.

*Hood River*.—From Slaymaker & Son. Perfect flower. The plants are of good growth and healthy foliage. Fruit of medium size, short, round conical form and dark, bright crimson color; seeds large, yellow and prominent, making the berry of very attractive appearance. The flesh is dark, rich and juicy. If the fruits were of larger size the variety would be a very valuable one for market or home use.

*Hoosier*.—Plants received from Ran Benoy, Matthews, Ind. Perfect flower. Plants of very strong, healthy growth. Berries very large, rather long, flattened conical or round conical in form; color, dark crimson; flesh dark, rich color, of high quality and firm. The fruit truss is large and stout, usually supporting fruit from the ground. The plants were very productive, the berries large, attractive, of high quality and firm. A variety of much promise.

*Howell No. 2*.—Received from E. J. Hull. Perfect flower. The plants are of rather weak growth, but the foliage is healthy. Fruits are large, long, flattened conical in form and bright dark scarlet in color, flesh very bright, juicy, high quality and quite firm. In attractiveness and quality of berry this variety has few superiors, but it was only moderately productive the past season.

*King Worthy*.—Plants from Edw. W. Cone, Menomonie, Wis. Perfect flower. Plants are of quite strong individual growth, but make few runners. The fruit is large, round sharp conical in form and of light, dull scarlet color. The flesh is light, of fair quality but quite soft. The color of the berry and its lack of firmness are against it as a market sort.

*Knight*.—Perfect flower. Plants of very strong, healthy growth. Fruit large, round or broad conical in form, bright dark scarlet color, seeds yellow and prominent. The flesh is bright, of high quality and firm. Productive. Judging from this season's trial, the variety is worthy a place among the best sorts.

*Little No. 7*.—From J. Little, Granton, Ont. Perfect flower. Plants of very strong, healthy growth. Berries of medium size, usually round, sharp pointed conical in form, color a dull scarlet; flesh bright, good quality and quite firm. The berries average too small in size to be valuable for market and their color is not attractive.

*Little No. 8*.—Plants from J. Little. Perfect flower. Plants of good growth. Berries of medium size, broad conical in form, and bright crimson in color. The fruits are attractive in appearance, of high quality and quite firm, but too few are borne to make the variety valuable as a market sort.

*Little No. 40*.—Plants from J. Little. Imperfect flower. The plants are of excellent growth and the foliage is healthy. The fruits are very large in size, broad conical, very regular and even in form; the flesh is usually light in color, of good quality and firm. The productiveness of the variety together with the large size of the berry, its attractive appearance, good quality and firmness of flesh make it a very promising market sort. The fruits, however, do not color evenly.

*Manwell*.—Received from Edw. W. Cone. Perfect flower. Plants of fair growth but are not so good plant makers as would be desirable. The fruits are very large, broad conical, usually ribbed, and dark crimson in color; the flesh is dark, juicy and rich. The plants are productive and the fruit has the qualities necessary to make the variety a very promising market sort.

*Maumee*.—Plants from Stayman & Black, Leavenworth, Kan. Plants of very strong growth and productive. Berries large, round or flattened conical in form and bright scarlet color. Promising in plant growth and productiveness, but the fruit lacks quality and firmness.

*Mayflower*.—Plants received from W. C. Babcock, Bridgman, Mich. Perfect flower. The plants are of very strong and healthy growth. The berries are of a medium size, long round conical form and of a bright scarlet color. The flesh is bright, juicy and of fair quality and moderate firmness. This variety was as early as any to ripen and the fruits color evenly and are attractive in appearance. Promising as an early sort.

*McKinley*.—From Ellwanger & Barry, Rochester, N. Y. Perfect flower. The plants did not get a good start and the growth was not satisfactory. Fruits of medium size, rather long pointed conical in form, often with slight neck; color dark crimson; flesh dark, bright and of good quality. The berries are much like Warfield in size and shape, but the color is not so dark or bright, and the quality is better. The plants were fairly productive, but further trial is necessary before judging plant growth and productiveness.

*Michigan*.—Received from J. T. Lovett Co., Little Silver, N. J. Perfect flower. Plants of medium growth. Berries large, round or broad conical in form and bright crimson color. The flesh is dark, of a good quality and very firm. This was the latest variety, by several days, to ripen fruits. In size, color, quality and firmness of fruit, the variety ranks high. If on further trial the plants show more vigorous growth it will be a most valuable late variety.

*Mineola*.—Plants from Slaymaker & Son. Perfect flower. The plants are of low, small growth. Berries of medium size, short round conical form; flesh light in color, soft and rather poor in quality. Very few fruits borne. The variety was of little value as grown here this year.

*Morgan Favorite*.—Plants from W. F. Allen, Jr., Salisbury, Md. Perfect flower. Plants of strong growth and the best foliage in the plot. Fruit very large in size, round sharp pointed conical form and bright dark crimson color; flesh bright, juicy, of high quality and firm. The variety was productive and but very few small berries were borne. The plant and fruiting qualities of this variety are such as to make it well worthy of trial for home use or for market.

*Omega*.—From Thompson's Sons. Imperfect flower. The plants are of fair growth. Fruit large in size, short round conical form, very dark crimson color, seeds yellow and prominent. The flesh is bright, juicy and of good quality. In attractive appearance and quality of fruit the variety ranks high. It was but moderately productive the past season.

*Patrick*.—Received from Edw. W. Cone. Perfect flower. Plants of medium growth. Fruit small in size, long or broad conical form, light scarlet color. The plants were productive, but the berries were too small.

*Peabody*.—Plants from J. Little. Perfect flower. The plants are of excellent growth and healthy in foliage. Fruit of medium size, round or broad conical in form and bright light scarlet color. Too many of the berries are small, the color is not attractive, the quality is poor and the fruit lacks firmness.

*Pct*.—Plants received from E. J. Hull. Perfect flower. Plants are not of strong growth and made few runners. Fruit medium to large in size, broad conical form and a bright dark crimson color. The flesh is bright, of good quality and firm. A good variety, but seems to have no qualities of special merit.

*Pride of Cumberland*.—From Slaymaker and Son. Perfect flower. Plants of fair growth. Fruit of medium size, round conical form with slight neck, color a bright scarlet. The berries are often hollow and the flesh is mealy and lacking in firmness.

*Quality*.—Received from M. Crawford. Perfect flower. The berries are as attractive in appearance as any grown in the plot; are large in size and of the highest quality. The plants made but little growth and the productiveness of the variety could not be determined.

*Ridgeway*.—Plants from M. H. Ridgeway, Wabash, Ind. Perfect flower. Plants of excellent growth and a good foliage. Fruit large, short, round conical in form and a bright crimson color. The plants are productive and the fruits very even in form, attractive in appearance, of good quality and firm enough to stand shipment well. A variety of much promise.

*Satisfaction*.—From Slaymaker & Son. Perfect flower. Plants of fair growth. Berry small to medium in size, round, rather long conical in form, and dark, bright crimson color. The fruits are handsome in appearance and have a high, aromatic flavor. An excellent dessert fruit, but the berries are too small for a market variety.

*Seaford*.—Received from L. J. Farmer. Imperfect flower. The plants of this variety were received late in the season and but a small growth was made. The berries are very large, long, broad conical in form, color a dark, rich crimson. The quality is very high and the berry is quite firm. Further trial is necessary to judge growth and productiveness. Under the unfavorable circumstances the showing was excellent. A variety of much promise.

*Shyster*.—Plants from Thompson's Son's. Imperfect flower. Plants of very strong growth and quite productive. Fruit large in size, broad conical somewhat ribbed in form, light scarlet color, quite attractive; flesh bright, juicy, but sour, moderately firm. The foliage blighted quite badly and the fruits did not ripen well at the tip.

*Star*.—Plants from E. W. Reid, Bridgeport, Ohio. Perfect flower. The plants are of good growth and have healthy foliage. Fruit large, broad

conical in form, color light bright scarlet; flesh bright, somewhat mealy, but of good quality. The plants were not as productive as could be expected from the good growth and the berries are scarcely firm enough to stand shipment well.

*Stevenson*.—Received from Edward Stevenson, Stevensville, Mich. Imperfect flower. The plants did not make a good growth and many were attacked by blight. Fruit small, short, round conical in form and dark crimson in color; flesh bright and of high quality. The berries are too small and the plants lack vigor and productiveness.

*Stone*.—From J. Little. Imperfect flower. Plants of very strong growth and foliage healthy. Fruit medium to large in size; long conical form, color bright scarlet. The flesh is bright, juicy and of fair quality, but moderately firm. It is early in season and the fruits are large for a variety ripening at the period it does. It holds out well in length of season though the last fruits are not large. Well worthy of trial as an early ripening variety.

*Unnamed*.—Received from J. Little. Perfect flower. The plants are of vigorous growth and have a healthy foliage. Fruits very large in size, of broad, long conical form, usually ribbed, color a bright scarlet. The flesh is dark, not juicy, but of high flavor, firm. The fruit-stem is large and stout, quite supporting the fruit from the ground. Very promising because of the vigor and productiveness of the plant, and the large size and good quality of the fruits.

*Wetzell*.—From J. Little. Perfect flower. Plants of good growth. Fruits medium to large in size, form short, round conical, color light scarlet. The berries are too light in color and too much flattened in form, while the plants lack productiveness.

*Whitney*.—Plants received from E. J. Hull. Perfect flower. The plants made a good growth, but did not set much fruit. The few very large berries borne were ribbed and irregular in form and of a bright scarlet color. Most of the blossoms failed to set fruit and many of the berries were imperfect. Of little value the past season.

*World's Champion*.—Plants from E. J. Hull. Imperfect flower. Plants of medium growth and but moderately productive. Fruit medium in size, round or broad conical in form and dark crimson in color; flesh dark, juicy, but sour. Plants lack productiveness and size of berries.

#### NEW VARIETIES OF 1897.

The following sorts were described at some length in the report of last season:

*Arrow*.—The plants are vigorous and fairly productive of fruits that are high in quality. The long narrow form of the fruit is against it as a market sort.



*Bostonian*.—Excellent in plant growth, but lacking in productiveness. The fruit is of good color and high quality, but many of the berries are small and imperfect.

*Cherokee*.—The plants are of fair growth and moderately productive, but while the berries are of good quality and quite firm, they are too small to be valuable.

*Dakota*.—Excellent in plant, but while a good crop of fruit was borne, the berries were too soft and small to make it a good selling variety.

*Fremont*.—The plants are of very strong growth and productive. The berries are of good form, fine appearance and good quality, and the crop holds out well in season. If the fruits were a little larger the variety would rank well up with the best.

*Gen. Fifer*.—Has developed no qualities of special merit.

*Gertrude*.—The plants are of good growth. Few berries were borne and most of those were small and imperfect in form. Of little value as grown here for two seasons.

*Giant*.—The plants were of stronger growth and more productive than last season. The fruit is attractive, of good quality and firm. It seems worthy of extensive trial.

*Glen Mary*.—Plants of good growth and healthy foliage. The variety is productive and the fruits large, of good quality and firm. Well spoken of wherever tried. One of the most promising sorts for market.

*Granville*.—Many of the berries are below salable size and the plants were not productive. The variety has no points of special prominence.

*Homestead*.—The variety was much more productive than last season, but the fruits are small and irregular in form.

*Ideal*.—Excellent in plant and the fruit is very attractive in appearance, of high quality and firm. Well worthy of being planted for home use or for market.

*Jerry Rusk*.—The plants were of scattering growth and quite badly attacked with blight. The berries are too small in size though of good quality and firm.

*Karl*.—This year as last the plants were the strongest in growth of any in the patch, but very few fruits were set and those borne were small and imperfect.

*Lanah*.—The plants were of good growth, more productive than last season and the berries of large size. Of some merit though not likely to occupy a prominent place.

*Marston*.—Good in plant growth and fairly productive. The berries are too small, the color unattractive and the quality low.

*Nan*.—Plants of fair growth and healthy. The berries were larger in size than last season and produced in greater number. The color and quality is good, but the variety is not productive enough to warrant extensive planting.

*No. 1000*.—Vigorous and healthy in plant growth and fairly productive. The fruits are very attractive in appearance, of high quality and firm, and although none are very large, there are few small ones. A good variety.

*Phippen*.—The plants are of very good growth, but poor in foliage. The fruits are of fair quality and firm, but lack in size and numbers.

*Plow City*.—The plants are of stronger growth than last season, but are not good runner makers. The fruits are of good size, form and color and hold out well in season. Appears a promising sort.

*Portage*.—This variety has shown up well the past season. The plants are of good growth and productive. The fruits are usually large, of good form and color and of fair quality and firmness. Many of the fruits are hollow or have a hard core. Of considerable value.

*Purdue*.—The plants were of only fair growth, but produced an excellent crop of fruit. The berries are of good size and quality, and are quite firm. It has a long season and the fruits hold up well in size. Seems worthy of trial as a market berry.

*Ruby*.—While the plants are of rather weak growth, the berry is nearly all that could be desired in form, color, quality and firmness. The size is good, but it is not among the largest. Worthy of extended trial.

*Sparta*.—The plants were of very strong growth and healthy in foliage, but set few fruits and those were small in size and of imperfect form. The berries are of high quality and firm. Of doubtful value.

*Sunrise*.—Good in plant growth, but lacking in productiveness and size of fruits.

*Tubbs*.—Plants are of fair growth and healthy. The berries are of good color and quality, but are too small and too soft for market.

*Beebe, Blonde, Bouncer, Champion, Cruse No. 9, Dictator, Early Bird, Equinox, No. 15, W., and Smith* were quite unsatisfactory in fruit or plant.

The following are older and better known sorts, that have been tested for at least three seasons:

*Aroma*.—Has made an excellent showing for several seasons as a berry of large size, high quality and good appearance. The plants are of good growth, but are only moderately productive.

*Beder Wood*.—Is largely grown as a fertilizer for pistillate sorts. The berries are rather soft and of a light color and the plants are often much injured by leaf blight.

*Bird*.—Did not make as good a showing this season as in the past. It still seems deserving of trial as a market berry.

*Brandycine*.—The fruits are large, of high quality and attractive appearance. One of the most promising of the large fruiting varieties for market or home use. The season is medium to late.

*Bubach*.—Is a well-known large fruited sort, especially adapted to strong soils, where it is one of the most valuable varieties.

*Clyde*.—On soils not easily affected by drought this is a very profitable variety. The berries are rather light in color and but moderately firm. An excellent fertilizer for pistillate varieties.

*Crescent*.—An old sort now being superseded by larger fruiting varieties. Productive, but towards the end of the season the berries are likely to be quite small.

*Gandy*.—Is largely planted as a late ripening variety. The fruits are large, of high quality and firm. The variety is moderately productive, but holds out well for several years.

*Greenville*.—Excellent in plant growth and productive of large fruits. The berries are not firm enough to stand shipment well, in other respects it is a valuable variety.

*Haverland*.—One of the most profitable varieties for home use or market. Productive. Fruits of good size and quality, and moderately firm. A good seller.

*Kansas*.—Excellent in plant growth and productive. The fruits are of good quality and firm. On strong soils and under high culture the variety would be valuable for market.

*Kossuth*.—The plants are of strong healthy growth, but are moderately productive. The fruit is of high quality and firm, but lacking in size.

*Leroy*.—The plants are strong and healthy in growth and have been uniformly productive of large crops of fruit. The berries are large, fine color, regular in form, of high quality and firm. An excellent market variety.

*Marshall*.—This season the plants were of strong growth and productive. The berries are large, dark red and uniform in size, of good quality

and firm. The foliage is somewhat subject to rust except upon strong, moist soils. One of the most promising large fruited varieties.

*Parker Earle*.—On a strong soil with plenty of moisture this is a good late market berry. The color is light and the quality is not high. It usually sets too many fruits.

*Princeton Chief and Mrs. Cleveland* are good in plant growth, productive, and the fruits are large and of excellent quality. They are valuable for home use or near market.

*Richmond*.—The plants were of good growth and made a much better showing in productiveness than last season. The berries are not very large, but all are of good size; they are attractive in appearance, good in quality and firm. If the berries were of large size, it would be a very valuable sort for market.

*Sherman*.—Plants of very strong, healthy growth, and productive. The fruits are large, good in color, of high quality and firm. The berries hold out well in size to close of season. This variety has been grown three seasons with excellent results.

*Splendid*.—If the fruits were of larger size this would be a valuable market variety. It takes high rank in other respects.

*Stahelin*.—The plants are of strong, healthy growth and productive. The berries are large, somewhat irregular in shape, of fine appearance and high quality, but rather soft. Valuable for home use or near market.

*Tennessee*.—Very strong and healthy in plant growth and productive. The fruits are large, of good color, firm and of high quality. The berries hold out well in size to close of season. A valuable variety for home use, or for market.

*Timbrell*.—A variety bearing large fruits of good quality. Its color is against it as a market berry. A good table sort.

*Warfield*.—One of the most profitable market berries grown. The variety is very productive and the dark rich color of the berry makes it a good seller. If the size of the fruits could be increased and the quality improved it would be the ideal berry.

*Wm. Belt*.—Last season this variety made an excellent showing in plant growth and bore a good crop of large, well formed fruits. It is one of the most promising of the large fruited sorts for market purposes.

#### SUMMARY OF VARIETIES.

The most promising of the new sorts are Fountain, Hoosier, Knight, Morgan Favorite, Ridgeway, Seaford, Unnamed and Mayflower for early and medium, and Michigan for late.

Of the varieties that have been tested for two seasons the following have the most promise: Fremont, Giant, Glen Mary, Ideal, Purdue, Plow City, Ruby and Wm. Belt.

Notwithstanding the advent of many newer sorts, it is doubtful if there are more profitable varieties for the market grower than Bubach, Haverland and Warfield with Beder Wood, Sharpless or Clyde as fertilizers for these pistillates.

For the grower of fancy fruit under intensive culture, it is possible that the large fruiting sorts Brandywine, Glen Mary, Marshall and Wm. Belt may be more profitable than the varieties named above that are usually more productive but bear smaller berries.

Bird, Greenville, Leroy, Snowball and Weston, among sorts not so widely known as the above, have given good results as market berries.

Aroma and Eureka bear large fruits, are late and have a long season. They are well worthy of trial as late varieties.

L. R. TAFT.

H. P. GLADDEN.

Agricultural College, Mich.,  
Oct. 15, 1898.

MICHIGAN  
STATE AGRICULTURAL COLLEGE  
EXPERIMENT STATION

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FARM DEPARTMENT

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164. Methods and Results of Tillage  
165. Draft of Farm Implements

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BY M. W. FULTON

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AGRICULTURAL COLLEGE, MICHIGAN  
1898

*The Bulletins of this Station are sent free to all newspapers in the State and to such individuals interested in farming as may request them. Address all applications to the Secretary, Agricultural College, Michigan.*

# MICHIGAN AGRICULTURAL EXPERIMENT STATION

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### SUB-STATIONS

Grayling, Crawford County, 80 acres deeded.  
 South Haven, Van Buren County, 10 acres rented; 5 acres deeded.

## **METHODS AND RESULTS OF TILLAGE.**

BY M. W. FULTON.

I. When the climatic conditions are normal, as in the fall, winter and spring of 1897-98, and oat ground is to be plowed before sowing, it is better, as far as the yield of grain is concerned, that the plowing be done in the fall. In the experiments reported in this bulletin there was a difference in yield of over nine bushels per acre in favor of the plots plowed in the fall over those plowed in the spring.

II. Rolling sandy loam for oats is indicated as good practice whether the rolling be done before or after the oats are drilled, although the difference in yield, attributable to variations in methods of preparation of the

III. Frequent cultivation of corn keeps the land moist and increases the total amount of water available to the crop. soil, was small.

IV. Such cultivation concentrates the moisture near the surface where it is more readily secured by the plant.

V. Plots cultivated frequently yielded 86.6 per cent more dry matter than uncultivated plots and 17.1 per cent more dry matter than plots cultivated infrequently.

VI. Uncultivated corn not only gave a very small yield but the corn as cut up for silage, was inferior in quality.

VII. Plots cultivated three inches deep yielded on the average 8.3 per cent more than plots cultivated five inches deep.

VIII. Frequent cultivation to a depth of three inches gave the best results in these experiments and is recommended for general practice.

IX. Wheat ground dries out very rapidly while the crop is ripening. The decrease in moisture in the upper three feet was found to be 16.27 per cent within one week. Drying out does not cease when the wheat is cut. Later in the season be dry a loss of more than 15 per cent of the moisture remaining when the wheat is harvested may be expected.

X. In the early spring unplowed land was found to contain more moisture than fall plowed land adjacent. Later in the season the reverse was the case.

XI. An important saving in soil moisture was effected by early spring plowing. Early plowing with thorough preparation of the plowed land will do much to prevent the loss of soil moisture.

## **DETAILS OF THE EXPERIMENTS.**

The experiments reported in this bulletin are a continuation of a series begun at this Station and partly reported in Bulletin 154, pages 267 to 272. The method of taking, drying and weighing the soil samples was the same as there reported, and the method of determining the per cent of moisture was also the same, the weight of the dry soil being taken as the basis of calculation. All samples unless otherwise noted were taken in foot sections to a depth of three feet.



## EXPERIMENTS IN THE PREPARATION OF OAT GROUND.

*Fall vs. Spring Plowing.*—This set of experiments compares, first, fall plowed and spring plowed land; second, land not rolled with that rolled before drilling, rolled after drilling, and rolled and harrowed after drilling. The plots were located in two separate fields. In field No. 15, one set of experiments was tried on fall plowed land and in field No. 8, two sets were tried, one on spring plowed and one on fall plowed land. Each set contained four plots so that each method of preparation with respect to rolling was tried on three separate plots and in two different fields.

The soil in No. 8 is reasonably uniform and the mechanical analysis found on page 267 of Bulletin 154 gives an idea of its general character. No. 15 is more rolling than No. 8, and the soil is also a little lighter, consequently its normal content of water is lower.

No. 15 was a timothy and June grass sod and its general preparation was as follows: Plowed the latter part of October, 1897; worked with spading harrow lapping half, April 13, 1898, going lengthwise of the furrow; harrowed twice with spring tooth harrow in the same direction, April 14th; cross harrowed with spike tooth harrow, April 14th and 15th; the oats, American Banner, were sown with an eleven hoe grain drill, April 15th.

The plots were made very narrow, two drill breadths, (fourteen feet) wide, and ran from near the west end of the field to the east end. The extreme length included was seventy-two rods. The special preparation of the various plots was as follows:

Plot 1. Not rolled.

Plot 2. Rolled before drilling.

Plot 3. Rolled after drilling.

Plot 4. Drilled and afterwards rolled, then harrowed with spike tooth harrow.

In connection with the growth and harvesting of these plots the following points should be noted:

April 30th the oats were just coming through the ground.

June 25th they were well headed out.

The cutting and shocking was done July 25th and the hauling August 3d. All the experimental oats were threshed October 8th. No marked difference in the growth of the oats on the several plots was noted at any time, but the oats in this field were much shorter than those in No. 8.

Field No. 8 grew corn in 1897, and the following will make clear the preparation of the two strips on which the oat experiments were duplicated. The fall plowing was done early in November and the land left with no further preparation until spring; April 16th this fall plowed strip was worked once with a spading harrow; April 18th it was worked lengthwise with a spring tooth harrow and April 21st cross dragged with the same harrow. The spring plowed strip was plowed April 12th and 13th. It was not worked with a spading harrow, but otherwise its treatment was exactly the same as that given the fall plowed strip up to the time of the special preparation of the individual plots.

The plots had the same width as in No. 15 and were ninety rods seven and one-half feet long.

All of the plots except Plot 5 were drilled April 25th. Plot 5 was left until April 26th on account of rain.

The following shows the preparation of each plot:

### Fall Plowed.

- Plot 1. Rolled and harrowed with spike tooth harrow April 30th, after drilling.  
 Plot 2. Rolled April 30th, after drilling.  
 Plot 3. Rolled and drilled April 25th.  
 Plot 4. Not rolled.

### Spring Plowed.

- Plot 5. Rolled and drilled April 26th.  
 Plot 6. Drilled then rolled April 30th and afterwards harrowed with spike tooth harrow.  
 Plot 7. Rolled April 30th after drilling.  
 Plot 8. Not rolled.

On account of rain the rolling and harrowing after the oats were drilled was not done until April 30th.

May 7th the oats were well up, June 25th they were just heading out; they were cut July 27th and hauled to the barn August 6th.

Determination of the moisture in the plots of No. 15 were made on five different dates, April 16th, 28th, May 5th, 12th and 24th.

Similar determinations were made in No. 8 on April 30th, May 13th, 31st, and June 7th.

### AVERAGE PER CENT OF MOISTURE IN OAT PLOTS AND YIELD.

No. 15. Fall plowed.	1st foot.	2nd foot.	3rd foot.	Average for three feet.	Yield per acre, lbs.
Plot 1, not rolled.....	14.27	13.25	16.03	14.52	1,534
Plot 2, rolled before drilling..	14.15	13.01	15.29	14.15	1,626
Plot 3, rolled after drilling..	15.39	15.65	15.43	15.49	1,550
No. 4, rolled and harrowed after drilling.....	12.39	12.57	15.91	13.62	1,660
General average.. . . .				14.44	1,592
No. 8. Fall Plowed.					
Plot 1, rolled and harrowed after drilling.....	14.79	14.60	14.57	14.65	1,510
Plot 2, rolled after drilling..	15.39	15.65	15.43	15.49	1,702
Plot 3, rolled before drilling..	15.67	15.54	15.56	15.59	1,585
Plot 4, not rolled.....	14.06	14.20	15.20	14.49	1,535
General average.....				15.05	1,583
Spring plowed.					
Plot 5, rolled before drilling..	13.35	13.29	14.72	13.79	1,333
Plot 6, rolled and harrowed after drilling.....	13.46	15.53	13.98	14.32	1,308
Plot 7, rolled after drilling..	13.47	13.72	14.70	13.96	1,373
Plot 8, not rolled.....	15.31	15.28	14.75	15.11	1,365
General average.....				14.29	1,345

The preceding table shows in No. 8 a marked difference in moisture in favor of the fall plowed land. In one case alone does a plot plowed in the

spring have an equal or larger amount of moisture than any plot of the fall plowed land. The average per cent of moisture to a depth of three feet for the fall plowed exceeds by .76 per cent that for the spring plowed. This means a difference in favor of the fall plowed land of about forty-five tons of water per acre. The difference was not apparent until May 31st, but was very marked on this and the succeeding date, June 7th. The average excess of moisture on these dates was 1.89 per cent, or 111 tons of water per acre. Attention is here called to the table on page 95, giving the average per cent of moisture for each date on which samples were taken.

The yields in No. 8 show a much greater difference in favor of the fall plowed land than did the moisture determinations. There is not a single instance in which a spring plowed plot equals in yield a plot plowed in the fall. The highest yield per acre on the spring plowed land was 137 pounds less than the lowest yield on the fall plowed. The average yield on the fall plowed is slightly over 23 per cent higher than that of the spring plowed. While, because of variations in conditions, no direct comparison can be made between No. 8 and No. 15, it is interesting to note that the average yield per acre in No. 15 is higher than on the fall plowed land in No. 8. It seems probable that No. 15 derived some considerable advantage from the fall plowing.

*Comparison of methods of preparation.*—An examination of the table given above does not show, as far as content of moisture is concerned, any marked difference in favor of any one of the special methods of preparation. The results in duplicate plots are completely at variance.

While the yields of these individual plots similarly treated do not agree perfectly, they are still sufficiently in accord to furnish us some instruction. It is to be noted that the sum of the yields of the three plots rolled after drilling is 4,625 pounds, while the yields of the three plots not rolled was but 4,434 pounds, a difference of 191 pounds or 4 per cent of the yield of the plots not rolled. Between the methods of rolling before drilling and rolling and harrowing after drilling there seems to be no appreciable difference. When to use the roller or whether to use it at all depends upon the character of the soil and its wetness. If the land be clay it is dangerous to use the roller in the spring. If it be wet the roller is forbidden altogether. With sand the case is different. Sandy soils are too open in texture as a rule to hold moisture and produce the largest yields. The use of the roller is therefore indicated.

Experiments in oat culture conducted by the Wisconsin Station are reported in the Wisconsin Annual Report for 1890. It was found that rolling increased the moisture in the upper two feet of soil, but samples taken from the surface to below a depth of two feet showed a difference in favor of the unrolled ground. This difference increased with the depth to which the samples were taken.

A larger per cent of germination was found on the rolled ground and consequently there was a better stand of oats. The oats on the rolled land yielded 61.12 bushels per acre by weight while those on the unrolled land yielded 58.89 bushels per acre. The oats from the rolled plot were found to have larger kernels and to weigh more per bushel.

Other Stations have done considerable work on oat culture. The following have secured results favoring fall plowing: Oklahoma, North Dakota, Kansas, Minnesota, while Kansas and North Dakota have found that spring plowing sometimes gives the better results.

Kansas, Minnesota, Illinois and Oklahoma have found results in favor of rolling the seed bed for oats. Ohio found no advantage on heavy clay but on a sandy soil found a marked advantage. Nebraska and Kansas have found that better yields are secured with the press drill than when oats are sown broadcast or with an ordinary hoe drill.

The evidence seems almost uniformly in favor of fall plowing and of compacting the seed bed, when the soil is loose in texture.

## CORN CULTIVATION.

### FREQUENT AND INFREQUENT, DEEP AND SHALLOW.

This set of experiments was designed to supplement the experiment in the cultivation of corn reported in Bulletin 154, page 268. The ground upon which the tests were made was located in Field No. 6, north of the drive. Two strips of land were used, one lying just west of the center of the field and the other near the west side, the distance between being about twenty rods. The individual strips were very uniform as to soil and quite level, but there was a marked difference in the character of the soil between the east strip and the west strip. The east strip was a sandy loam, inclined to be gravelly below a depth of one foot. The west strip was not quite so sandy at the surface and had more clay below the first foot. In taking soil samples the solid clay was usually reached in the third foot. No mechanical analysis has been made of samples taken directly from these strips, but in 1897 samples were taken across the field in two parallel lines, one just west of the east strip and the other just east of the west strip. The samples from each line, five in number, were quite uniform and were mixed to form a composite sample. The results of the analyses of the air dried soil are given below:

#### MECHANICAL COMPOSITION OF SOIL FROM THE WEST HALF OF NO. 6.

	East strip.	Water	Organic matter	Fine gravel	Coarse sand	Medium sand	Fine sand	Very fine sand	Silt	Fine silt and clay
Soil .....	.54	4.00	7.34	9.99	17.84	29.78	8.67	8.63	14.52	
Subsoil .....	.14	1.68	9.79	11.92	16.03	31.85	9.02	5.63	13.66	
West strip.										
Soil .....	.44	4.10	4.55	6.66	12.07	31.03	13.68	10.29	16.08	
Subsoil .....	.18	1.82	6.25	8.41	15.12	33.93	14.63	6.75	13.22	

The above analyses show fairly well the difference in soil between the two strips, except that in the third foot from which no sample for analysis was taken, the difference was most marked, there being a much larger per cent of clay in the west strip than in the east strip at this depth. The two strips, each containing four plots, were six hundred and two feet long. Each plot contained five rows of corn and was eighteen and three-fourths feet wide. The object of having two strips was to duplicate the work as far as possible in every detail and this plan was adhered to throughout the entire experiment. The east strip grew roots in 1897, the west strip was in oats that year, and was plowed in the fall. The preparation of both strips was as follows:

Plowed May 17th and 18th; harrowed with spring tooth harrow, May 23d; cross harrowed with spike tooth harrow, and rolled the same day.

May 24th, planted with two horse planter to Hathaway Yellow dent corn. Worked with a weeder May 28th.

The plots in each strip were numbered from 1 to 4 consecutively from east to west, and the treatment of like numbers was exactly the same. Plot 1 had no cultivation. Plot 2 had frequent cultivation, depth three inches. Plot 3 had frequent cultivation, depth five inches. Plot 4, had ordinary cultivation, depth five inches. By ordinary cultivation we mean cultivated as in ordinary practice.

A "Gale" two-horse cultivator was used until the corn became too large for a two-horse cultivator, after which a "Planet Jr." one horse cultivator was used. The following is a record of the cultivation throughout the season:

Plots 2 and 3 were worked with a weeder June 3d, 8th, and 18th; with the Gale cultivator June 14th, 20th, 25th, July 2d, 4th and 5th, and 11th, and with the Planet Jr. cultivator July 20th, 29th, August 4th, 12th, 19th, 27th, and September 5th. Plot 4 was cultivated with the Gale cultivator June 14th, 20th, July 4th and 5th, and 11th. The cultivation July 4th and 5th was across the plot, and was the only cultivation in this direction that the plots received. July 20th to 23d the weeds were cut from all of the plots except No. 1, care being taken to disturb the soil as little as possible.

It should be noted that at all times care was taken to cultivate only when the soil was in fit condition, for this reason cultivation was not done at regular intervals. The cross cultivation July 4th and 5th was to a depth of four inches. A mistake was made in allowing the cultivator to go below a depth of three inches in Plot 2, as wherever the cultivator teeth penetrated the undisturbed soil many corn roots were injured.

The following observations were made during the season:

July 2d, soil very much more compact on Plot 4 than on Plots 2 and 3. Plot 1 begins to show the effects of lack of cultivation as the corn has a yellowish tinge and is rather spindling. The ground in this plot is now completely covered with weeds.

July 5th, unthrifty condition of Plot 1 in both strips more marked than before. The moisture in Plot 4 is within one-half inch of the surface, while on Plots 2 and 3 there is a mulch of from one to two inches of dry earth.

July 11th, Plot 2 of the east strip more even and thrifty than any other plot and noticeably larger. Plot 2 on the west strip also more even than the other plots but there is no marked difference in the size of the corn.

July 22d, east strip. Plot 1 has made no growth lately and is dying badly. Plot 2 has a very even growth and is just tasseling. Plot 3, corn somewhat smaller than in Plot 2 and not so even; not so far along in tassel. Plot 4, similar to Plot 3.

July 22d, west strip. Corn not so far along as in east strip. Plot 1 shows the same unfavorable conditions as in the east strip. Plot 2 not so much larger than Plots 3 and 4, but shows the same even growth as in the east strip. Plots 3 and 4 same as in the east strip.

July 27th, corn in the east strip curling from the effect of dry weather. The hot dry weather has affected Plots 2, 3 and 4 about alike. The west strip has not suffered so much from dry weather.

Determinations of moisture were made weekly during the growth of the corn, and a record of these determinations is here given:

*Per cent of moisture in the corn plots, No. 6.*

**EAST STRIP.**

	Plot 1.				Plot 2.			
	1st foot. Per cent.	2d foot. Per cent.	3d foot. Per cent.	Average for 3 feet. Per cent.	1st foot. Per cent.	2d foot. Per cent.	3d foot. Per cent.	Average for 3 feet. Per cent.
June 4 .....	9.61	7.95	7.54	8.37	11.84	8.57	12.63	11.01
June 14 .....	13.40	6.52	9.53	9.82	13.59	9.33	7.23	10.05
June 21 .....	8.30	9.53	9.92	9.25	10.63	9.19	8.66	9.49
June 28 .....	12.66	7.98	9.59	10.06	11.97	8.68	11.72	10.79
July 5 .....	5.76	5.33	7.93	6.34	8.75	8.59	9.02	8.79
July 12 .....	5.23	5.24	8.14	6.20	7.45	7.26	9.68	8.11
July 19 .....	3.64	4.78	7.45	5.29	4.68	4.73	9.43	6.28
July 26 .....	2.85	3.00	4.32	3.39	3.25	3.96	8.06	5.09
Aug. 2 .....	2.45	2.84	3.93	2.91	2.93	3.99	10.92	5.95
Aug. 9 .....	4.44	2.01	3.51	3.32	5.22	2.39	6.50	4.70
Aug. 16 .....	3.90	2.58	4.58	3.69	3.93	2.99	5.45	4.12
Aug. 23 .....	5.47	2.89	5.80	4.72	6.20	3.07	4.94	4.74
Aug. 30 .....	2.81	2.75	5.42	3.66	3.56	2.75	5.60	3.94
Sept. 7 .....	5.66	2.89	5.59	4.71	6.00	4.61	5.38	5.33
Sept. 12 .....	4.24	4.69	4.68	4.54	5.35	4.54	3.78	4.56
Oct. 1 .....	9.43	5.95	2.65	6.01	7.52	4.93	2.32	3.92
Oct. 22 .....	12.14	9.87	7.56	9.86	11.72	5.72	3.63	7.02
	Plot 3.				Plot 4.			
	1st foot. Per cent.	2d foot. Per cent.	3d foot. Per cent.	Average for 3 feet. Per cent.	1st foot. Per cent.	2d foot. Per cent.	3d foot. Per cent.	Average for 3 feet. Per cent.
June 4 .....	10.55	7.21	14.00	10.59	11.81	11.17	17.25	13.41
June 14 .....	13.44	8.46	6.22	9.39	12.53	6.16	12.05	10.25
June 21 .....	11.14	8.41	8.61	9.39	11.53	8.38	9.31	9.67
June 28 .....	12.45	10.03	11.93	11.47	12.00	10.79	10.11	10.97
July 5 .....	8.80	7.23	9.67	8.57	8.53	8.34	8.88	8.58
July 12 .....	8.36	7.97	9.43	8.59	7.98	5.42	10.00	7.80
July 19 .....	7.17	4.91	8.10	6.73	6.21	5.63	8.91	6.92
July 26 .....	3.64	4.86	7.46	5.32	3.35	4.05	8.28	5.23
Aug. 2 .....	3.29	4.26	7.99	5.18	2.45	3.39	6.38	4.07
Aug. 9 .....	5.98	5.99	2.69	4.89	4.07	3.06	4.28	3.80
Aug. 16 .....	3.81	3.48	5.22	4.17	4.29	3.33	6.35	4.66
Aug. 23 .....	5.96	4.10	5.87	5.31	5.25	3.39	5.61	4.75
Aug. 30 .....	3.75	3.51	6.11	4.46	3.28	2.80	5.47	3.88
Sept. 7 .....	6.01	3.25	6.25	5.17	6.68	2.99	5.23	4.98
Sept. 12 .....	4.76	4.08	4.44	4.43	4.30	3.44	8.99	5.38
Oct. 1 .....	7.88	3.73	4.54	5.38	8.05	3.02	2.78	4.62
Oct. 22 .....	13.91	5.07	2.78	7.25	13.86	8.35	5.73	8.98

*Per cent of moisture in the corn plots in No. 6.—Continued.*

## WEST STRIP.

	Plot 1.				Plot 2.			
	1st foot. Per cent.	2d foot. Per cent.	3d foot. Per cent.	Average for 3 feet. Per cent.	1st foot. Per cent.	2d foot. Per cent.	3d foot. Per cent.	Average for 3 feet. Per cent.
June 4.....	11.28	6.92	12.84	10.35	11.63	8.75	15.27	11.88
June 14.....	12.16	10.81	13.96	12.31	14.10	9.15	14.61	12.62
June 21.....	10.24	11.17	12.13	11.18	11.74	6.95	13.95	10.88
June 28.....	12.02	10.43	17.44	13.31	15.45	9.77	16.90	14.04
July 5.....	9.66	8.15	14.14	10.65	11.50	10.89	14.61	12.90
July 12.....	5.38	6.27	13.85	8.50	9.98	10.97	12.98	11.29
July 19.....	6.21	5.63	8.91	6.92	8.38	6.68	12.29	9.10
July 26.....	2.89	5.14	11.47	6.50	4.21	5.64	13.03	7.63
Aug. 2.....	2.23	2.80	7.44	4.19	3.27	4.56	10.49	6.11
Aug. 9.....	4.90	2.70	5.83	4.48	5.98	4.48	7.21	5.89
Aug. 16.....	4.90	4.05	11.47	6.81	5.96	5.29	10.93	7.13
Aug. 23.....	6.86	4.53	10.95	7.45	6.17	4.06	12.12	7.45
Aug. 30.....	5.54	4.95	10.62	7.04	3.61	5.02	11.61	6.75
Sept. 7.....	6.02	5.80	13.11	8.14	6.52	3.86	12.81	7.40
Sept. 12.....	5.80	4.71	11.05	7.19	5.56	3.87	8.19	5.71
Oct. 1.....	10.92	6.59	9.59	9.03	7.81	4.43	5.08	5.76
	Plot 3.				Plot 4.			
	1st foot. Per cent.	2d foot. Per cent.	3d foot. Per cent.	Average for 3 feet. Per cent.	1st foot. Per cent.	2d foot. Per cent.	3d foot. Per cent.	Average for 3 feet. Per cent.
June 4.....	10.89	10.04	11.81	10.91	8.90	10.63	16.69	12.04
June 14.....	11.78	9.92	13.67	11.77	10.22	13.27	14.24	12.58
June 21.....	11.05	7.19	11.09	9.78	10.61	9.78	12.50	10.95
June 28.....	17.12	9.07	13.04	13.08	13.75	11.30	15.01	13.35
July 5.....	10.92	11.38	10.53	10.94	9.41	11.29	12.26	10.98
July 12.....	10.46	10.78	13.24	11.49	9.65	9.10	11.48	10.06
July 19.....	9.25	7.35	13.81	10.14	10.18	8.18	9.64	9.33
July 26.....	6.10	6.34	13.21	8.55	4.97	6.50	12.61	8.08
Aug. 2.....	3.54	5.39	11.21	6.71	3.35	5.04	15.04	7.81
Aug. 9.....	6.70	3.95	7.43	6.04	4.97	5.08	8.54	6.20
Aug. 16.....	5.64	4.72	11.19	7.18	4.50	6.85	12.67	8.01
Aug. 23.....	6.95	5.14	11.05	7.71	6.19	5.84	11.38	7.79
Aug. 30.....	5.64	6.20	13.79	8.88	4.89	5.78	8.93	6.53
Sept. 7.....	6.55	5.53	14.38	8.82	6.81	7.53	8.80	7.71
Sept. 12.....	5.56	5.65	10.20	7.14	5.34	7.62	8.51	7.16
Oct. 1.....	7.86	5.99	8.81	7.55	10.53	8.58	11.23	10.11

The dates and amount of the rainfall from April 1st to October 31st, 1898, are given in the following table:

*Rainfall April 1 to Oct. 31, 1898.*

April.	May.	June.	July.	August.	September.	October.
1..... .21	1..... .10	1..... .16	3..... .05	2..... .60	4..... .20	1..... .02
9..... trace	9..... .12	7..... .11	8..... .87	3..... .10	5..... .69	4..... .32
16..... "	10..... .05	10..... .33	19..... .07	8..... .10	6..... .08	7..... .26
17..... .11	14..... .02	11..... .15	28..... trace	15..... .15	15..... .17	11..... .41
19..... .83	18..... .24	18..... .33	29..... .10	16..... .30	18..... .15	12..... .08
20..... trace	19..... .90	18..... .47		17..... 1.16	23..... .46	13..... .12
22..... .54	20..... .19	20..... trace		24..... .02	24..... 1.25	14..... .02
25..... .27	28..... .33	24..... 2.50				17..... .80
28..... .12		27..... .33				18..... .11
		30..... .06				20..... .18
						21..... .16
						25..... .97
						29..... .09
						30..... .06
2.08	1.95	4.44	1.09	2.43	3.00	3.54

The final table in the series shows the average moisture in each foot in depth of the several plots on each strip from June 4th to September 7th, inclusive. It is as follows:

## AVERAGE PER CENT OF MOISTURE FOR THE SEASON.

*East strip.*

	1st foot.	2nd foot.	3rd foot.	Av. for three feet.
	Per cent.	Per cent.	Per cent.	Per cent.
Plot 1, no cultivation.....	6.16	4.70	6.66	5.84
Plot 2, frequent cultivation, 3 in.....	7.15	5.72	8.23	7.03
Plot 3, frequent cultivation, 5 in.....	7.45	5.98	7.83	7.09
Plot 4, ordinary cultivation.....	6.28	5.64	8.44	6.79

*West strip.*

	1st foot.	2nd foot.	3rd foot.	Av. for three feet.
	Per cent.	Per cent.	Per cent.	Per cent.
Plot 1, no cultivation.....	7.16	6.36	11.73	8.42
Plot 2, frequent cultivation, 3 in.....	8.41	6.81	12.74	9.35
Plot 3, frequent cultivation, 5 in.....	8.75	7.36	12.10	9.40
Plot 4, ordinary cultivation.....	7.74	8.26	11.41	9.14

It is evident from the table giving the average moisture during the growth of the corn that Plot 3 in the east strip has the largest amount of moisture of any in that series. Plot 2 is next with but a slight decrease; Plot 4 is next and Plot 1 has the smallest amount of any. The same table shows us that in the west strip the relative amounts of moisture stand in exactly the same order. The variation in moisture is nearly the same in both series. The evidence in favor of frequent cultivation for preserving moisture is very strong, inasmuch as the duplicate trials agree perfectly and the results are in exact accord with those secured in the experiments of 1897.

The difference in moisture between plots cultivated 5 inches deep and those cultivated shallow is small, but the results on one strip confirm those on the other, both as to the total amount of water present during the season as a whole and as to the variation in water content from period to period. The table shows that the average moisture for the first and second feet of Plot 3 is invariably larger than for similar depths in Plot 2. It also shows that in the third foot of Plot 3 there is less moisture than in the corresponding foot of Plot 2. Throughout the driest part of the season, after July 5th, there was continuously more moisture in Plot 3, in both strips than in any other plot. The moisture in the upper foot of the soil is manifestly larger on every date when a sample was taken, in Plot 3, than in the other plots. There are single exceptions, but as a rule the statement is true. In the second foot after July 5th there is again more moisture in the Plot 3, cultivated five inches deep than in the other plots. The results vary as to the amount of moisture in the third foot. On the east strip the third foot in depth seems to be more wet in Plot 2, cultivated three inches deep than in Plot 3, where the cultivation was five inches deep. On the west strip the third foot in depth contains more



moisture in Plot 3, cultivated five inches deep than in Plot 2, except on the dates July 5th and August 23rd. The relative moisture content of Plots 2 and 3 is not materially different.

Prof. King has secured results similar to these in plots cultivated one and one-half and three inches deep. On pages 279 and 280 of the Wisconsin Report for 1894, the results of twelve determinations to a depth of four feet are given. In the third plot five determinations out of twelve show more moisture in the shallow than in the deep cultivated plot and in the fourth foot six out of the twelve show the same thing. In only one instance in the first foot in depth is there more moisture in the plot cultivated shallow than in the one deeply tilled. In the second foot there is not a single case of this kind. The total evidence in these experiments is largely in favor of the deep cultivation. It must not be concluded that, because cultivation to a depth of five inches secures more moisture, that five inches is the depth to be preferred for corn. The discussion of this point must be reserved until the yields of corn from the different plots are examined.

In connection with the effect of deep cultivation on the distribution of soil moisture, the effect of frequent and infrequent cultivation should be noted. In the east strip the third foot in Plot 4, infrequently cultivated, has more moisture than any other plot at the corresponding depth. Plot 4 of the west strip has more moisture in the second foot than any other plot at the corresponding depth. And the average of the second and third feet for Plot 4 on each strip is higher than that of any other plot of the same strip. The average moisture for two feet below the first foot is as follows:

	Plot 1.	Plot 2.	Plot 3.	Plot 4.
	Per cent.	Per cent.	Per cent.	Per cent.
East strip.....	5.68	6.97	6.90	7.04
West strip.....	9.04	9.77	9.73	9.83

The difference in moisture as indicated by these figures is small, it is true, but each of these amounts is the average of fifty-six samples. This fact and the farther one that the duplicates agree exactly indicates that the results are not a matter of chance.

We believe that they go far toward confirming the following propositions:

First, thorough and frequent cultivation conserves moisture and increases the total amount available for the crop.

Second, such cultivation concentrates the moisture near the surface, where it is more readily secured by the plants.

The growth of corn on adjacent strips on soil differing in fineness, the other conditions being the same, gives an opportunity for determining something as to the amount of water the crop was able to secure from the two kinds of soil. Approaching the subject from the other side the following short table shows the decrease in moisture per square foot of horizontal area to a depth of three feet. In the first column of the table is given the pounds of water at the beginning of the season in a section of soil a foot square in horizontal area and three feet deep; in the second and

third columns the same facts for August 9th and September 7th, respectively, and in the fourth and fifth columns the decrease of moisture in pounds to the dates given:

	June 4.	Aug. 9.	Sept. 7.	Decrease.	
				to Aug. 9.	to Sept. 7.
East strip, lighter soil .....	lbs. 29.27	lbs. 11.27	lbs. 13.64	lbs. 18.00	lbs. 15.53
West strip, heavier soil .....	30.50	15.25	21.64	15.25	8.86

We have no means of determining the upward flow of water from below the depth of three feet, nor the amount of rain water utilized by the crop in each case. It will appear later that the yield on the heavier soil was less than on the lighter, confirming seemingly the indications of the above figures that the lighter soil actually supplied more moisture than the heavier, notwithstanding the larger water holding capacity of the latter. This is contrary to the usual belief and is worthy of mention.

#### THE YIELD OF CORN.

The corn was cut with a harvester September 10th and 12th, and immediately drawn to the barn, weighed and cut into a silo. Samples were taken before cutting for the determination of dry matter. The ends of all the rows and the side rows of each plot were rejected. The harvested portion was thus limited to three rows (in all eleven and one-quarter feet wide, and five hundred and ninety-five feet long). At the time of harvest no difference in the growth of the corn plots 2, 3 and 4 of either strip could be detected. It was all large and well eared. The corn on Plot 1 was from two and one-half to three feet high, having but few ears and these merely soft nubbins.

The yield per acre of green corn and of dry matter on the several plots is given in the next table.

	East strip.		West strip.	
	Green weight.	Dry matter.	Green weight.	Dry matter.
Plot 1, no cultivation .....	lbs. 2,186	lbs. 723	lbs. 1,848	lbs. 620
Plot 2, frequent and shallow .....	13,207	5,532	12,258	4,790
Plot 3, frequent and deep .....	12,687	4,799	12,700	4,728
Plot 4, infrequent and deep .....	12,167	4,380	10,514	3,849

In the east strip the yields of green fodder stand in the same order as the per cents of moisture noted in previous tables, except that Plots 2 and 3 are reversed. In the west strip, Plots 2 and 3 are not reversed. The green weight is not, however, the true indication of the returns of feeding value from the fields. What the farmer wants is not gross weight but feeding value, and this fact is determined by the pounds of dry matter yielded. Comparing then the yields of dry matter on the several plots we find that the order for the east strip remains the same, while Plots 2 and 3 are reversed in the west strip, making the sequence of plots in order of

greatest yield as follows: Frequent cultivation, 3 inches deep; frequent cultivation 5 inches deep; ordinary cultivation 5 inches deep, and no cultivation.

The per cents of dry matter in the yields of the different plots are as follows:

	Plot 1.	Plot 2.	Plot 3.	Plot 4.
	Per cent.	Per cent.	Per cent.	Per cent.
East strip.....	33.06	41.89	37.53	36.00
West strip.....	33.53	39.08	37.23	36.61

It is interesting to note that the per cents of dry matter stand in the same order as the yields. This fact goes to show that not only does proper cultivation give larger yields but the product is more valuable pound for pound.

Experiments have shown almost conclusively that a thick mulch is more effective than a thin one in conserving moisture. That the deeply cultivated plots should have more moisture than the others was to be expected; but deep cultivation, especially after the corn roots are well developed, injures so many roots that it is not strange that the growth of the corn should be checked and the yield reduced. To decide how deep the cultivation may be to secure a good mulch and at the same time not injure the corn roots will require much experimentation. Out of twenty trials conducted by the Wisconsin Station (Wis. Report 1894, page 282) comparing cultivation one and one-half and three inches deep, fourteen favored three inches and five favored one and one-half inches. The average yield for the twenty trials in favor of three inches was 1.08 per cent. In the trials reported in this bulletin the average yield in favor of the three inch cultivation is 8.34 per cent.

On the plots cultivated three inches deep it was noted that, after the roots had developed, they occupied the soil to the lower limit of the mulch formed by the cultivators. The teeth could not have run deeper without destroying many roots. These facts seem to indicate that three inches is approximately the correct depth for corn cultivation. The character of the soil should be taken into consideration. On the east strip the difference in favor of the three inch cultivation was 15.27 per cent, while in the west strip where the soil was heavier, the difference was only 1.31 per cent.

Experiments at the Ohio Station do not confirm these results. There, on a gravelly soil, trials extending over two years gave an advantage of 7.64 per cent. in favor of shallow cultivation in yield of grain, while similar trials on a heavy clay soil gave 8.14 per cent. advantage for the same cultivation. Further investigation along this line is much needed.

A very important result of our experiment is the evidence it gives in favor of frequent cultivation. The frequent cultivation at a depth of three inches gave an increase of approximately 25 per cent. over infrequent cultivation. In the east strip there is an advantage in favor of frequent, deep cultivation of 9.6 per cent. In the west strip of 22.8 per cent. or an average of 16.2 per cent of water in favor of the frequent deep over the infrequent deep cultivation. It is possible that the frequent cultivation late in the season did not contribute largely to this result. The point is undecided, but this much is true, that frequent cultivation did increase the yield to a very marked degree. It cannot fail to be of great importance to

the farmer that frequent cultivation will not only keep his corn fields free from weeds but will bring an actual return in yield that will more than compensate him for the extra labor.

A word of explanation about the yield of the uncultivated plots is called for. Growth on these plots had practically ceased July 25th. After this date the corn simply dried up. When it was cut the stalks themselves were found to be green and watery and the proportion of dry matter was less than in the cultivated plots.

#### THE DRYING OUT OF THE GROUND DURING THE RIPENING OF WHEAT.

The observations were made in Field 6 growing a crop of Currill wheat, which was cut July 4th. Samples for the determination of moisture were taken on June 28th and again on July 5th, the day after the wheat was cut. In the following table there is set forth the results of these determinations:

	1st foot.	2nd foot.	3rd foot.
	Per cent.	Per cent.	Per cent.
June 28th.....	14.73	8.91	15.01
July 5th.....	10.19	8.85	11.41
	4.54	.06	3.60

The work was repeated on a plot in Field No. 3, sown to Dawson's Golden Chaff wheat and cut July 7th. The facts in that case are as follows:

	1st foot.	2nd foot.	3rd foot.
	Per cent.	Per cent.	Per cent.
June 29th.....	15.16	6.82	6.36
July 8th.....	10.35	7.60	7.18
	4.81	-.78	-.82

The wheat was moderately ripe in both cases when cut. There were two light showers between the time of taking the first and second samples, the rainfall amounting to .11 inches. There is in both cases a marked decrease in moisture during the ripening period. Comparing the amounts on the first date with those on the second there is an average decrease of 16.27 per cent. This suggests that when the saving of moisture is important on account of a clover or timothy crop to follow, the wheat should be cut at the earliest possible moment. Afterwards the stubble may be clipped with a mower to form a protecting mulch. The drying out of the soil does not cease when the wheat is cut, as is shown by the following observations, made in Field 6 and Davenport plots Nos. 1, 7, 66 and 68:

*Field 6.*

	1st foot.	2nd foot.	3rd foot.
July 5th.....	Per cent.	Per cent.	Per cent.
July 26th.....	10.19	8.85	11.41
	4.03	10.90	10.47
	6.16	-2.05	.94
<i>Davenport Plot 1.</i>			
July 8th.....	10.35	7.60	7.18
July 26th.....	13.21	7.24	7.87
	-2.86	.36	-1.19
<i>Davenport Plot 7.</i>			
July 8th.....	10.37	11.40	8.98
July 26th.....	8.39	5.90	9.10
	1.98	5.50	-1.12
<i>Davenport Plots 66 and 68, north end.</i>			
July 12th.....	21.65	9.45	8.06
July 26th.....	13.58	9.06	8.24
	8.07	.39	-1.18
<i>Davenport Plots 66 and 68, south end, sandy.</i>			
July 12th.....	9.79	6.66	3.56
July 26th.....	7.50	7.44	6.28
	2.29	-.78	-2.72

The Davenport plots 66 and 68 were tested separately and the figures given are the averages of the two samples. Where samples were taken from the north end of these plots the soil was mucky for the first foot in depth. The samples marked third foot were in reality but six inches in depth, making a total depth of but two and one-half feet instead of three feet. Except as indicated above the soil was a loam with a clay subsoil.

While these results are somewhat variable the average loss is quite marked, being 15.47 per cent, or more than one-seventh of the total moisture remaining in the ground after the wheat was harvested. The loss must have occurred through evaporation as the clover upon the areas where the samples were taken had made very little growth before July 26th. To prevent this evaporation a mulch, even if no more than the stubble cut by a mower as before suggested, might be of a marked benefit to the seedling.

## DRYING OUT OF SANDY SOIL BY CLOVER.

On July 15th, 1897, an unmown clover plot was plowed for green manure. Five days later the following amounts of moisture were found on this plot and on an adjoining plot that had to that late date lain fallow:

	1st foot.	2nd foot.	3rd foot.	Average three feet.
	Per cent.	Per cent.	Per cent.	Per cent.
No crop.....	9.30	7.59	7.65	8.15
Clover.....	9.89	2.75	2.67	5.10
	—59	4.84	4.88	3.05

There was 62.5 per cent. more moisture in the soil of the plot that had borne no crop than in the plot that had borne the clover.

In taking samples on the clover plot, a layer of dry sand about a foot thick was found. The upper limit of this dry sand was fourteen to sixteen inches below the surface. It contained but 1.12 per cent of moisture. Its presence in the second and third foot explains the very low per cent. of moisture at these depths.

## LENGTH OF TIME REQUIRED FOR A HEAVY RAIN TO SOAK INTO A DRY SOIL.

On the 21st of July 1.22 inches of rain fell. This was followed on July 26th by the very unusual rainfall of 4.34 inches. After these rains the following observations were made on the clover plots before mentioned:

	1st foot.	2nd foot.	3rd foot.	Average three feet.
	Per cent.	Per cent.	Per cent.	Per cent.
July 26th.....	16.76	10.55	4.60	10.64
July 27th.....	12.91	8.06	8.51	9.83
July 28th.....	12.52	7.68	8.01	9.40
July 31st.....	9.51	6.78	7.03	7.74

On July 26th there was still a layer of dry soil in the third foot. On the 27th this had disappeared and the moisture was more evenly distributed through the three feet. It was not until July 31 that the moisture became normally distributed. This gives an idea of the length of time required for the flow of water in an open sandy soil to the dryer parts. In a less porous soil the time required is much greater as is shown by the following observations:

An opportunity was afforded in Field 6 on the two strips of corn ground, the behavior of which has been described in the previous pages of this bulletin, to determine the apparent rate and extent of the downward movement of water after rain. Samples were taken September 12th, October 1st and October 22d. As shown in the table of rainfall on page 86, this weather was wet almost continuously after the 1st of October, and on

this account the evaporation from the surface was slight. The following table shows the per cents of moisture in the two strips to a depth of three feet on the dates given:

	East Strip				West Strip.			
	1st foot.	2nd foot.	3rd foot.	Average three feet.	1st foot.	2nd foot.	3rd foot.	Average three feet.
	Per ct.	Per ct.	Per ct.	Per ct.	Per ct.	Per ct.	Per ct.	Per ct.
Sept. 12th.....	4.66	4.19	5.47	4.77	5.56	5.39	9.49	6.81
Oct. 1st.....	8.22	4.41	3.07	5.23	9.28	8.53	8.66	8.82
Oct. 22nd.....	12.66	7.26	4.92	8.28				

These figures show first that the 2.03 inches of rain that fell between September 12th and October 1st made no increase in the moisture whatever below the second foot and in the east strip very little below the first. In the third foot, on the other hand, there is actually a decrease. This is difficult to explain, but the statement is true in five out of the eight individual plots examined. See table of moisture determinations for the season, page 85.

In the second place the table shows that the 2.43 inches of rain between October 1st and October 22d made a marked increase in the first and second feet, but in the third the increase was so slight that the moisture on October 22d was not as high as on September 12th. We have here an instance of 4.46 inches of water added to the soil in the course of five weeks, and yet no increase of the moisture in the third foot.

#### A COMPARISON IN APRIL OF THE MOISTURE CONTENT OF FALL PLOWED AND UNPLOWED LAND.

This test was made in Field No. 8, in corn the year previous and partly plowed in the fall. Samples were taken on both the unplowed and fall plowed areas on April 11th, 15th and 18th. The average per cent of moisture in these samples for the two areas is here recorded:

	1st foot.	2d foot.	3rd foot.	Average three feet.
	Per cent.	Per cent.	Per cent.	Per cent.
Unplowed.....	17.61	15.58	15.38	16.19
Fall plowed.....	16.14	14.93	15.83	15.64
	1.47	.65	-.45	.55

In Field No. 6.—Fall plowed grew sugar beets and the unplowed, mangels in 1897.

Unplowed.....	11.33	8.95	10.64	10.31
Fall plowed.....	11.37	8.13	10.33	9.94
	-.04	.82	.31	.37

The balance is unquestionably in favor of the unplowed land under the conditions existing in our experiments during the early spring.

Results secured later in the season show the opposite to be true for the late spring. On the 6th and 17th of May, samples were taken on ground which had grown oats the previous year, one area of which was fall plowed and another left unplowed, with the following average results:

	1st foot.	2d foot.	3d foot.	Average three feet
Unplowed.....	Per cent. 10.51	Per cent. 7.09	Per cent. 8.71	Per cent. 8.77
Fall plowed.....	10.56	7.62	8.59	8.92
	— .06	— .53	.12	— .15

Here there is a difference in favor of the fall plowed. The stirred soil has acted as a mulch to retard evaporation, hence the change.

The moisture determinations by dates in the oat plots in No. 8 also show a larger per cent of moisture in the fall plowed land as the season progresses.

AVERAGE MOISTURE IN OAT PLOTS, NO. 8.

	April 30.		May 13.		May 31.		June 7.	
	Fall.	Spring.	Fall.	Spring.	Fall.	Spring.	Fall.	Spring.
	Percent.	Percent.	Percent.	Percent.	Percent.	Percent.	Percent.	Percent.
Not rolled.....		17.67	15.17	16.65	15.22	14.71	13.08	11.43
Rolled and harrowed....	14.74	15.64	15.46	17.43	16.09	13.65	12.33	10.58
Rolled and drilled.....	19.40	15.95	14.98	15.67	15.87	13.61	12.13	19.92
Drilled and rolled.....	16.70	15.98	15.33	14.26	17.49	15.02	12.45	10.60
Average.....	16.95	16.31	15.23	16.00	16.17	14.25	12.50	10.63

In the above table the average for the fall plowed for the first two dates is 16.09 per cent. and for the spring plowed 16.15 per cent. or practically the same. For the last two dates the average for the fall plowed is 14.33 per cent. and for the spring plowed 12.44 per cent. Here is a marked difference in favor of the fall plowed land, a difference evidently much greater after the middle of May than before.

In the Wisconsin Report for 1891, on page 102, a record is made of two determinations of moisture on fall plowed clover sod and unplowed corn ground. Samples were taken May 14th and an average difference of .77 per cent. of moisture to a depth of three feet was found in favor of the fall plowed land. Prof. King, who tried the experiment, says that the fall plowing was done very late and on clover sod. On these accounts the rain had not had the chance to establish good capillary connections with the undisturbed soil and hence it was acting as a much better mulch than stubble ground would have made, or than the same ground had it been plowed earlier in the season so that the fall rains could have helped join the two together.



## EFFECT OF EARLY PLOWING ON THE RETENTION OF SOIL MOISTURE.

Two tests were made of this question in Field No. 6. The plowing was done May 2d. Samples were taken for determination of moisture on May 10th and 17th, with the following results:

May 10th	1st foot.	2d foot.	3rd foot.	Average three feet.
Spring plowed.....	Per cent. 10.50	Per cent. 10.07	Per cent. 8.04	Per cent. 9.54
Not plowed.....	10.10	8.12	7.26	8.49
	.40	1.95	.78	1.05
May 17th.				
Spring plowed.....	9.33	6.75	6.97	7.68
Not plowed.....	8.78	5.92	6.82	7.17
	.55	.83	.15	.51

This gives a difference in the first instance of 2.8 pounds per square foot to a depth of three feet and of 1.4 pounds in the second instance, in favor of the land plowed early in the spring.

Experiments tried by Prof. King and reported in the Wisconsin Report for 1891, pages 101 and 102, show larger differences. The plowing was done April 29th and samples taken May 6th showing a difference for the upper three feet of 7.02 pounds of water per square foot. On another plot the observed difference of the samples taken May 14th to the same depth was 4.65 pounds.

These determinations all show that to have as large a supply of moisture as possible for the crop it is necessary to plow or work the soil in some way to form a mulch to prevent evaporation as early in the spring as the condition of the land will allow.

## DRAFT OF FARM IMPLEMENTS.

M. W. FULTON.

These tests began in 1895. A self recording dynamometer made by Aultman, Miller & Co., of Akron, Ohio, was used. All tests were of one minute duration and the distance traveled varied little in the different trials. The average draft for each trial was determined from the curve made by the recording pencil, by a planimeter, which gave the average height of the curve above the base line.

### DRAFT OF WIDE AND NARROW TIRES.

Two wagons were used in these trials. The tires of one were one and five-eighths inches wide, of the other four inches. The diameter of the wheels was the same for both wagons. The front wheels were forty inches high and the hind wheels four feet. A uniform load, including wagon, of four thousand five hundred pounds was adopted.

The first trial was made on a gravel road, firm and dry. The draft of the narrow tire was 151 pounds and of the wide tire 141 pounds, a difference of ten pounds in favor of the wide tires. This agrees with the Missouri experiments which will be referred to later in the bulletin, but is directly opposed to the popular opinion.

Next on a sandy road, upon which the soft sand two inches deep rested upon a subsurface not smooth nor hard, the draft of a wagon with narrow tires was 263 pounds, with wide tires 217 pounds, a difference of 46 pounds in favor of the wide tires. It so happens unfortunately that there are several miles of road of this sandy character in the State and it is interesting to note that where the gross weight of the wagon and load is 4,500 pounds it is drawn more easily upon wide tires than upon narrow ones.

The next trial to be reported took place upon a stiff June-grass sod about the middle of October, with, of course, the same load as in all other trials, viz., 4,500 pounds including wagon. Upon the sod, the draft of the wagon with narrow tires was 334 pounds, that of the wagon with wide tires, 256 pounds, a difference of 78 pounds or 23.35 per cent. in favor of the wide tires. The next day upon a clover and timothy sod the narrow tires cut in two inches deep under the heavy load and the draft of the wagon was 590 pounds, while the wagon with the wide tires cut in but one inch and the pull was but 430 pounds, 160 pounds or 27.11 per cent. less than the power required to draw the narrow tires.

On the same day a trial was made on corn stubble, driving between the rows. The narrow tires sank in two and one half inches requiring a pull of 731 pounds to move them; the same load upon the wide tires moved at a pull of 491 pounds, sinking in but one inch. Here was a difference in draft of 240 pounds or 32.83 per cent. almost one-third less than with the narrow tires.

These results all favor, to a very marked degree, the wide tires. While upon the gravel road, hard, smooth and well packed, the difference in draft

is but 6.62 per cent. using the narrow tire as a basis, upon sod or raw ground the difference is so marked as to be decisive.

The Missouri Station has conducted elaborate trials, comparing wide and narrow tires, using a self-recording dynamometer as in our tests and with a net load of 2,000 pounds. The wide tires were six inches wide and the narrow ones one and one-half inches. The following is a partial summary of their conclusions. (Missouri Bulletin 139, page 165.)

"I. On Macadam street, as an average of the two trials made, a load of 2,518 pounds could have been hauled on the broad tires with the same draft that a load of 2,000 pounds required on the narrow tires.

"II. Gravel road. In all conditions of the gravel road, except when wet and sloppy on top, the draft of the broad tired wagon was very much less than that of the narrow tired wagon. Averaging the six trials, a load of 2,482 pounds could be hauled on the broad tires with the same draft required for 2,000 pounds on the narrow tires.

" \* \* \* \* \* Summing up all the tests on dirt roads, it appears that there are but three conditions on which the broad tires draw heavier than the narrow tires, viz.: (1) when the road is sloppy, muddy or sticky on the surface and firm or hard underneath; (2) when the surface is covered with a very deep, loose dust and hard underneath; (3) when the mud is very deep and so sticky that it adheres to the wheels on both kinds of wagons. It appears that the dust must be extraordinarily deep to show a higher draft for the broad than for the narrow tires. The three conditions just named, therefore, are somewhat unusual and of comparatively short duration. Through a majority of days in the year, and at times when the dirt roads are most used, and when their use is most imperative, the broad tired wagons pull materially lighter than the narrow tired wagons.

"IV. A large number of tests on meadows, pastures, stubble lands, corn ground, and plowed ground in every condition, from dry, hard and firm to very wet and soft, show without a single exception a large difference in draft in favor of the broad tires. This difference ranged from 17 to 120 per cent.

"V. It appears that six inches is the best width of tire for a combination farm and road wagon and that both axles should be the same length so that the front and hind wheels run in the same track."

It is not within the purpose of this bulletin to speak at length of the effect of the habitual use, upon the one hand, of broad tires and on the other of narrow ones, on the ordinary dirt roads of the country. The point cannot be passed, however, without calling attention to the fact that the deep ruts common in sections where narrow tires alone are used, are rare or entirely wanting in those sections where broad tires prevail.

#### INFLUENCE OF THE POSITION OF THE LOAD ON THE WAGON UPON THE DRAFT.

On October 19, a comparison was made between the draft of the wagon when the load was equally distributed upon all four wheels and the draft of the same wagon when the load was piled over the rear axle. Two trials were made in each case. The draft of the wagon when the load was equally distributed was 149 pounds, when almost entirely upon the hind wheels, 147 pounds, practically the same. These trials were made on a hard gravel road. A few days later upon a June grass sod the average of two

trials in each case shows that with the load distributed the draft was 167 pounds, with the load on the front wheels, 294 pounds, upon the rear wheels, 289 pounds. These results seem to show that where the road is firm and smooth it is immaterial whether the load is evenly distributed over the four wheels or not, but where the ground is soft the draft is increased if the weight is very largely upon the front or the hind wheels.

#### THE INFLUENCE OF POINT OF ATTACHMENT OF THE POWER UPON THE DRAFT.

These tests were made upon a gravel road in the first case level, and, in the second, with a grade of six feet to the hundred. In the first case where the dynamometer was attached in such a way as to bring the whiffletrees in a normal position the draft was 188 pounds; when the power was applied at the end of the tongue, nine and one-half feet ahead of the ordinary point of attachment, the draft was 174 pounds. Where the load was drawn up the grade mentioned, when the whiffletrees were in the ordinary position the draft was, as the average of two trials, 366 pounds; when the horses were hitched to the end of the tongue as before the draft was 379 pounds. These trials do not show a marked difference in draft which can be attributed to the difference in point or method of attachment.

#### HOW MUCH DOES GREASING THE AXLES REDUCE THE DRAFT?

Two trials were made to determine the draft of a wagon on the level gravel road with the stated load. The draft on the average was 188 pounds. The wheels were then removed, the grease wiped from the skeins and boxes of the wheels and a little grit added. The wagon was then drawn over the course three times showing an average draft of 230 pounds, an increase of 42 pounds or 22.34 per cent.

#### DRAFT OF SUBSOILERS.

Late in the fall of 1896 a test was made of the draft of two forms of subsoil plows. In one case the loosening of the subsoil was accomplished by forcing through it a flat tongue-shaped piece of steel. In the other curved teeth stir up the subsoil. Three teeth were used each approximately an inch in width and so curved as to dig to a considerable depth below the bottom of the furrow left by the ordinary plow. Subsoiler No. 1 was provided with a wheel which maintained a uniform depth. No. 2, with the curved teeth, had no appliance for regulating the depth and in practice it was found impossible to keep it from gouging in deep in the softer places and running somewhat shallower than desired in others.

The average draft on four trials of each subsoiler at an average depth of ten inches below the bottom of the furrow left by the ordinary plow was for No. 1, 504 pounds and for No. 2, 606 pounds. To draw a subsoil plow is, therefore, very heavy work for a team.

#### THE DRAFT OF SPRING TOOTH HARROWS.

A test, comparative in its nature, was made with a floating spring tooth harrow having fifteen teeth and a riding spring tooth harrow with seventeen teeth. The latter covered a width of five feet and nine inches

between the outside teeth; the float harrow was a little narrower. The test was made on a freshly plowed sandy loam, the depth three inches. With the driver riding, the draft of the wheel harrow, average of four trials, was 513 pounds; with the driver walking the draft was 346 pounds as the average of four trials. The draft of the floating harrow under the same conditions was 402 pounds.

On an unplowed compact loam, harrowing to a depth of four inches, two trials gave an average draft of 370 pounds with the driver on the seat and 513 pounds as the average with the driver walking. Under the same conditions the average of two trials with the floating harrow was 608 pounds. These tests go to show that the weight of the driver adds very materially to the draft on loose soil, but makes less difference on compact ground. They show also that the wheel harrow, the driver walking, does its work with less draft than the float harrow, the gain being much more appreciable upon compact than upon loose soil.

It is fair to presume that the draft of these harrows is approximately the same as that of harrows in general. It is no wonder that exerting such a continuous and heavy force in addition to the labor of traveling over soft ground makes harrowing one of the hardest jobs for a team on the farm. In the test of wagons with a gross load of 4,500 pounds, in only a few cases did the draft exceed the average of the harrow test. In plowing to a depth of six inches the draft rarely exceeded 350 pounds and the average is probably below 300 pounds.

The modern harrows pulverize the soil very completely and as a consequence must draw hard. They are suited rather for three or even four horses than for two.

#### THE DRAFT OF MOWERS.

On the 7th of July a test of the draft of two five-foot cut mowers was made in a field of clover and timothy where the yield of hay was approximately two tons per acre. The machines were unlike in the mechanism adopted to drive the cutter bar. Both machines were new at the beginning of the season and had had practically the same usage previous to the test. The knives were sharp. Each machine was given three trials with the following averages. No. 1, 244 pounds and No. 2, 246 pounds. These figures show about the draft required by a five-foot cut mower on reasonably level ground, in medium heavy grass.

**BULLETINS 166-167**

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COWS YIELDING 300 POUNDS OR MORE OF FAT.

166. A Grade Dairy Herd.  
167. A Discussion of Farm Dairy Methods.

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AGRICULTURAL COLLEGE, MICHIGAN  
1899



**MICHIGAN**  
**STATE AGRICULTURAL COLLEGE**  
**EXPERIMENT STATION**  
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*The Bulletins of this Station are sent free to all newspapers in the State and to such individuals interested in farming as may request them. Address all applications to the Secretary, Agricultural College, Michigan.*

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## SUB-STATIONS

Grayling, Crawford County, 80 acres deeded.  
 South Haven, Van Buren County, 10 acres rented; 5 acres deeded.

## A GRADE DAIRY HERD.

THE FIRST YEAR OF ITS HISTORY.

CLINTON D. SMITH.

The usefulness of the Babcock test and scales in selecting from a herd, the cows which are turning in little or no profits to the owner has been often demonstrated. When, however, a dairyman finds it necessary to purchase in a limited time a herd of twenty-five or thirty grade dairy cows, he can scarcely expect to use these modern appliances. No farmer is willing to sell his best cow, and could the buyer weigh her milk and test it for a week's time it would be no advantage to him, because the owner, having his estimate of the value of his cow confirmed, would refuse to sell her. Often the buyer has not sufficient time to make tests of milk of the cows he buys. As he drives from farm to farm making his purchases he must depend upon the lessons derived from his experience and study to teach him to judge, by the form and handling of a cow, her ability in the dairy.

In bulletins 127 and 149, and in several annual reports of the Station, the records of many cows in the herd of pure breeds at the College are given. It has been our good fortune to develop Holsteins and Jerseys that have given enormous yields of milk and butter with relatively small expenditure of food. The lessons to be drawn both from the extraordinary yields and their small cost were not impressed upon the dairy community because it was believed that the chief factor in them was the breed of the cow. It was thought that the success of the Station in this line of work was to be attributed very largely, if not wholly, to the excellence of the foundation stock. To test the efficacy of good feed and continuous good care on the development of dairy cows and to test farther the question whether a grade dairy herd could be kept at a profit under conditions existing in central Michigan, the State Board having the Experiment Station in control decided to purchase a herd of thirty grade cows, to erect for their shelter a barn of sufficient size and to feed and care for them as a prudent and economical dairy farmer would do.

The College had no special facilities for buying cows. Enquiry was made by letter as to the price of cows in different localities and as to their breeding as well. Visits were made to those sections where it was reported that good grade Shorthorn cows were to be had, livery rigs were hired and a canvass made of the territory from farm to farm, following the ordinary

methods of the stock buyer. In no community visited were cows found to be either plenty or low in price. To secure the number determined upon it was found necessary to buy nearly every cow offered. Nine cows were purchased in the vicinity of Delhi Mills and Dexter, in Washtenaw county, seven were bought near Bay City and thirteen in Ingham and adjoining counties. Although the breeding of few of the cows could be ascertained it was evident from their appearance that most of them had a strong infusion of Shorthorn blood in their veins. The cows designated as Nos. 86 and 97 show some Jersey blood, while Nos. 87 and 104 evidently trace to some Holstein ancestor. Twenty-one cows were bought between August 25th and September 30th, 1897, seven were delivered at the College October 6th, and one cow was received as late as October 20th.

The herd was housed in a dairy barn built for the purpose and described on page 116, of Bulletin 149. This barn was barely completed on the arrival of the herd and provided storage room for hay, grain and bedding only. The silage had to be hauled forty rods from the silos at another barn.

A regular herdsman was employed by the month, who fed and cared for the whole herd and milked part of the cows; students were employed to milk the remainder at the stated price of five cents per day per cow. The herdsman began October 1, 1897, and left us April 1, 1898. His wages were \$31.00 per month. He kept an account of the time devoted to the herd, which varied from month to month, but averaged, during the fall and early winter, two-thirds of his time. Later it required his full time. After April 1, another herdsman was employed at a salary of \$26.00 per month, devoting his whole time to the care of the herd.

A careful account has been kept with the herd, charging it with the cost of the cows, the traveling expenses incidental to their purchase, the freight to Lansing, the wages of the herdsman, the cost of milking, the feed and pasture, and the cost of making the butter. In the accounts given below the quantity of material as well as the price at the College is given, that the reader may estimate what the cost of keeping the cows a year would have been in his immediate locality. The earliest date at which the annual accounts with the herd could begin was October 1, 1897, hence the account given below is divided on that date, charging the herd with the net cost of the twenty-one cows purchased before that time, taking into consideration, as far as they are concerned, their cost delivered at the College and their feed between the time of their arrival and October 1, on the one hand, and the receipts from them on the other.

During the fall and the first few days of December the milk was creamed and churned and the products sold separate from the milk yielded by the herd of pure bred. After the first week of December, and until the first of May, the milk was used in common with other milk, either yielded by the pure bred herd or purchased, for instruction, in cheese and butter making, to the regular and special students. The herd was credited with the milk at the price paid the farmers. During the fall the skim milk was fed calves and pigs. A record was kept of the amount of grain purchased for this auxiliary stock, and when these calves and pigs were sold the herd was credited with the receipts. Since, during the winter, the milk was sold outright this method could not be continued. After May 1, the product was sold through two channels. A good share of the cream was sold at sixty cents per gallon to ice cream manufacturers. The remainder

of the cream was churned into butter and sold at varying prices. A part of the skim milk during the summer of 1898 was fed to calves belonging to this herd. There was, however, a large surplus, amounting to 43,466 pounds, which was fed to other stock. It cannot be unjust to credit this amount of skim milk at fifteen cents per hundred, making \$65.20. The amount of butter made during the summer was 1,335.36 pounds, for the making of which at three cents per pound the herd should be charged \$40.06. The butter sold at twenty cents per pound in May, sixteen cents in June, twenty-one cents in August and in September at twenty-two cents.

With the explanations given, the following set of accounts will indicate the various transactions with the Grade Dairy Herd, for the year beginning October 1, 1897:

## GRADE DAIRY HERD.

Date.	Dr.		Date.	Cr.	
Aug. 25	To 9 cows and calf, Delhi Mills	\$353 00	Aug. 31	By 730.2 lbs. milk at 90c	\$6 57
	freight on same	21 27			
27	traveling expenses	9 82	Sept. 30	By 6,825 lbs. milk at 90c	61 43
31	3 cows bought at Lansing	120 00			
	3 " " " "	105 00			
	care of cows 23 hours, 10c	2 30			
	156 lbs. bran, \$12.00	94			
	156 lbs. rye, \$3.00	62			
	9 1/4 weeks' pasture, 25c	2 28			
Sept. 4	To 2 cows, bought at Lansing	82 00			
7	expenses tuberculin test	6 67			
18	1 cow bought at Lansing	45 00			
22	1 " " " "	40 00			
30	2 " " " "	55 00			
	milking, 5c per cow per day	14 57			
	74.5 lbs. hay, at \$10.00	37			
	617 lbs. skim milk, at 20c	1 23			
	489 lbs. bran, at \$12.00	2 98			
	489 lbs. rye, at \$3.00	1 96			
	69.8 weeks' pasture, 25c	17 45			
		<u>\$882 41</u>		balance	<u>814 41</u>
					<u>\$882 41</u>
Oct. 1	To balance	\$814 41	Oct. 16	By 150 lbs. veal, at \$5.50	\$8 25
6	7 cows at Bay City	250 00	31	110 lbs. butter, at 22c	24 20
	freight on same	17 00		135 lbs. butter, at 20c	27 00
	traveling expenses	9 80		28.5 lbs. milk, at 2c	57
13	16 pigs	35 00		13 gal. cream, at 60c	7 80
20	1 cow, at Lansing	38 00		13.66 gal. cream, at 90c	10 93
31	making 245 lbs. butter, 3c	7 35			
	care and milking	30 73			
	6,046 lbs. bran, at \$9.50	28 71			
	1,796 lbs. corn meal, \$15.00	13 46			
	1,000 lbs. oil meal, \$13.50	9 25			
	6,640 lbs. hay, \$3.00	16 60			
	3,685 lbs. sugar beets, \$2.50	4 60			
	2,462 lbs. silage, \$2.50	3 08			
	1,235 lbs. corn stalks, \$2.00	1 24			
	960 lbs. green clover, \$2.00	96			
	240 lbs. middlings, \$10.50	1 28			

Date.	Dr.		Date.	Cr.	
Nov. 30	To care and milking.....	\$37 40	Nov. 30	By 435.5 lbs. butter, 22c.....	\$95 81
	making 435.5 lbs. butter 3c.....	13 07		135.7 lbs. cream, 10c.....	13 67
	7,930 lbs. sugar beets, \$2.50.....	9 95		7 lbs. milk, 2c.....	14
	4,330 lbs. shredded fodder, \$2.00.....	4 33			
	1,830 lbs. hay, \$5.00.....	5 45			
	3,932 lbs. corn meal, \$15.00.....	29 85			
	300 lbs. oil meal, \$18.50.....	7 40			
Dec. 17	To milking to date, at 5c per cow per day.....	49 90	Dec. 31	By 261.5 lbs. butter, 22c.....	61 93
31	care of herd.....	20 72		5 lbs. butter, 24c.....	1 20
	making 234.5 lbs. butter, 3c.....	8 60		1 gal. cream, 80c.....	80
	4,700 lbs. hay, at \$5.00.....	11 75		10,575 lbs. milk, \$1.10.....	116 33
	2,570 lbs. roots, \$2.50.....	3 21		239 lbs. veal, \$5.00.....	11 95
	2,000 lbs. bran.....	11 00			
	1,500 lbs. oil meal, \$18.50.....	13 87			
	5,437 lbs. stalks, \$2.50.....	6 85			
	22,010 lbs. silage, \$2.50.....	27 51			
	5,275 lbs. corn meal, \$12.00.....	31 65			
	1,136 lbs. middlings, \$12.00.....	6 81			
Jan. 31	To care of herd.....	31 00	Jan. 31	By 17,239 lbs. Milk, at \$1.20.....	206 87
	100 lbs. cotton seed meal.....	9 92		1,985 lbs. pork, at \$3.50.....	69 47
	1,000 lbs. linseed meal.....	8 90		833 lbs. veal, at 4c.....	35 52
	24,320 lbs. silage, at \$2.50.....	30 32		425 lbs. veal, at 4½c.....	19 17
	6,152 lbs. corn stalks, \$2.50.....	7 69			
	11,250 lbs. beets, \$2.50.....	14 18			
	5,625 lbs. hay, \$5.00.....	14 16			
	319 lbs. corn, \$12.00.....	4 91			
	319 lbs. middlings, \$13.00.....	5 32			
	¼ ton salt.....	5 00			
Feb. 4	To 5 pigs.....	16 00	Feb. 11	By 131 lbs. veal, at 5c.....	6 55
19	milking.....	34 40	28	15,358 lbs. milk, \$1.20.....	184 29
28	care of herd.....	26 72			
	935 lbs. middlings, \$14.00.....	6 05			
	935 lbs. corn meal, \$16.00.....	6 92			
	7,110 lbs. bran, \$14.00.....	49 77			
	100 lbs. oil meal, 89c.....	4 49			
	1,187 lbs. cotton meal, \$19.20.....	11 40			
	21,475 lbs. silage, \$2.50.....	26 84			
	3,125 lbs. stalks, \$2.50.....	3 90			
	13,510 lbs. beets, \$2.50.....	16 88			
	3,881 lbs. hay, \$5.00.....	22 20			
Mar. 31	To care and milking.....	44 75	Mar. 23	By 1,680 lbs. pork, \$3.40.....	57 12
	22,310 lbs. silage, \$2.50.....	23 51	27	1,140 lbs. beef (102) \$2.75.....	31 35
	16,400 lbs. roots, \$2.50.....	20 50		125 lbs. veal, 5c.....	6 30
	7,375 lbs. hay, \$7.00.....	27 91	31	16,317 lbs. milk, 85c.....	138 69
	2,419 lbs. corn meal, \$15.00.....	18 14			
	5,580 lbs. bran, \$16.00.....	44 64			
	300 lbs. cotton meal, \$19.20.....	2 83			
	350 lbs. middlings, \$14.00.....	2 45			
	950 lbs. stalks, \$2.50.....	1 18			
Apr. 14	To tuberculosis test.....	12 12	Apr. 30	By 312 lbs. veal, 4c.....	12 48
30	care and milking.....	38 62		15,889 lbs. milk, 90c.....	143 00
	2,750 lbs. silage, \$2.50.....	3 48			
	4,120 lbs. corn meal, \$15.00.....	30 90			
	300 lbs. cotton meal, \$19.40.....	8 73			
	11,015 lbs. bran, \$13.20.....	72 70			
	7,330 lbs. hay, \$5.00.....	18 45			
	2,230 lbs. beets, \$2.50.....	2 78			
May 31	To care and milking.....	55 90	May 31	By 100 gals. cream at 60c.....	60 00
	3,469 lbs. hay, \$5.00.....	8 67		524.9 lbs. butter, at 20c.....	104 98
	5,607 lbs. corn meal, \$15.00.....	50 45			
	600 lbs. cotton seed meal, \$19.40.....	5 82			
	108 weeks' pasture, 25c.....	27 00			
June 30	To care and milking.....	40 12	June 30	By 135 gals. cream at 60c.....	81 00
	115 5-7 weeks' pasture, 25c.....	28 93		418.8 lbs. butter at 16c.....	67 01
	182 lbs. cotton seed meal.....	1 76			
July 3	To 45,780 lbs. hay at \$5.00.....	137 34	July 31	By 245.93 gals. cream at 60c.....	147 56
13	2,000 lbs. hay at \$4.00.....	4 00			
31	19 3-7 weeks' pasture, 25c.....	29 86			
	2,400 lbs. corn meal, \$17.00.....	20 40			
	231 lbs. cotton seed meal.....	2 72			
	care and milking.....	26 25			

Date.	Dr.		Date.	Cr.	
Aug. 31	To care and milking.....	\$27 98	Aug. 31	By 108 gals. cream at 60c.....	\$61 80
	119 4-7 weeks' pasture, 25c.....	29 80		220.25 lbs. butter at 21c.....	46 25
	2,375 lbs. corn meal, \$16.00.....	19 00			
	2,687 lbs. bran, \$12.00.....	15 82			
	143 lbs. salt.....	1 43			
Sept. 30	To care and milking.....	43 90	Sept. 30	By 75 gals. cream at 60c.....	45 00
	111 8-7 weeks' pasture, 25c.....	27 86		171.41 lbs. butter at 22c.....	37 71
	3,089 lbs. bran, \$12.00.....	48 23		2,320 lbs. beef at \$3.10.....	71 92
	1,410 lbs. corn meal, \$16.00.....	11 23		43,466 lbs. skim milk at 15c.....	65 30
	service of bull.....	25 00			
Oct. 1	To making 1356.36 lbs. butter.....	40 06	Oct. 1	By inventory as follows:	
				25 cows.....	900 00
				21 tons hay, \$6.00.....	126 00
				4 tons bran.....	48 00
				6 calves, 2,053.5 lbs. 4c.....	82 14
				1 calf.....	15 00
	Net profit.....	277 58			
		<u>\$3,310 96</u>			<u>\$3,310 96</u>

This account may be summarized as follows :

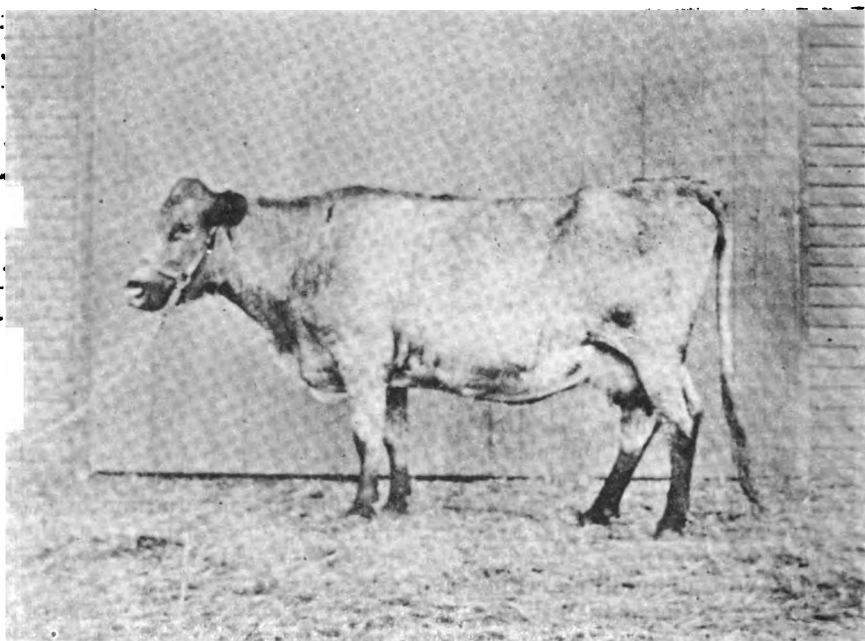
THE GRADE HERD.		Dr.
To 29 cows, average cost delivered at the college, \$39.51.....		\$1,145 00
care and milking the same.....		520 51
making and selling 2,302.5 lbs. butter at 2c.....		69 08
salt.....		6 43
green clover.....		96
105,807 lbs. silage.....		119 74
94,310 lbs. hay.....		266 54
42,427 lbs. bran.....		270 87
31,068 lbs. corn meal.....		236 96
57,705 lbs. beets.....		72 10
21,279 lbs. corn stalks.....		35 19
4,400 lbs. linseed meal.....		40 31
2,560 lbs. cotton seed meal.....		34 23
574 1-7 weeks' pasture.....		143 54
pigs.....	51 00	
3,410 lbs. middlings.....	21 89	
service of bull.....		72 89
		25 00
		<u>\$3,050 06</u>
By calves sold, 2,272 lbs.....		\$100 22
pigs sold, 3,605 lbs.....		126 50
butter, 2,302.5 lbs.....		466 00
cream, 708.69 gallons.....		428 56
milk, 75,414.1 lbs.....		789 89
skim milk, 43,466 lbs.....		65 30
3 cows sold during the year, 3,460 lbs.....		108 27
excess of receipts over expenses in September 1897.....		16 98
inventory.....		1,231 14
		<u>\$3,327 64</u>

These accounts show the total receipts, exclusive of the inventory, of property on hand at the close of the year, to be \$2,079.82, of which \$1,684.54 came from the sale of milk and its products. The total expenditures, including the cost of the cows, was \$3,050.06. Excluding the cost of the cows and of the hay and bran on hand at the close of the year, the net expenses of the herd amounted to \$1,730.37. Taking out the cost of the pigs and the middlings which they ate, we have \$1,657.48 as the cost of keeping, feeding and milking, or \$57.15 per cow, on the basis of the twenty-nine animals constituting the original herd. The feed alone, including pasture, came to \$1,042.89, or \$35.96 per cow, leaving \$21.19 per cow as the cost of care, milking and making butter.

The net profit from the year's transactions amounts to \$277.58, as shown by the above accounts. This, however, does not, by any means, represent the total benefit to the farm. For several successive days the manure made in the barn was weighed, the average being 1,600 pounds per day. The floors of the stable and gutters are practically water tight, and there was little loss of fertility when the cows were in the stable.

Since a minimum amount of bedding was used the manure consisted almost entirely of the solid and liquid excrements of the cows. Its entire weight for the winter was approximately one hundred and fifty tons. After April 15th the cows ran in a pasture lot adjacent to the barn during the day, where a part of the manure at least was wasted, distributed over an area where it was not badly needed. It is safe, however, to estimate the total tonnage of manure hauled to the fields at two hundred tons. The cows were well fed and the manure could not fail to contain a high per cent of fertilizing material. No exact money value can, of course, be ascribed to it.

It should be said in concluding the discussion of this phase of the subject that the cost of care, milking and incidentals, \$21.19 per cow, is unduly high. The chief factor in that amount is the milking. For various reasons, including the good of the herd itself, it was found necessary to milk in a short time both morning and night. This necessitated the employment of a larger number of milkers than was economical, and, since the milking was done largely by students who had to come from distant rooms and make a change of clothes for a short period of work, it increased the price per cow to five cents per day.



## NOTES ON INDIVIDUAL COWS.

It was inevitable that the method followed in purchasing should result in bringing into the herd some unprofitable cows. The herd had necessarily to be sifted by the performance of the cow her first year. It was part of the plan to record the yields of all the cows, and to dry off and sell for beef those that did not yield 6,000 pounds of milk and 300 pounds of butter in twelve months, and replace them by other purchases.

In the following table is recorded the number by which the cow is known, her purchase price, yield of milk, of fat, the estimated amount of butter, the number of weeks she was milked, the date of the birth of her calf, if it occurred after October 1, 1897, and finally her present value, as determined by the separate estimates of competent cattle men:

No.	Cost.	Milk yield, pounds.	Fat yield, pounds.	Estimated butter yield, pounds.	No. of weeks milked.	Date of birth of calf.	Present value.
18	\$30 00	6,073.2	268.33	301.38	42	.....	\$35 00
39	25 00	7,309.9	266.85	311.82	46	March 29, 1898.....	30 00
86	40 00	5,687.7	244.36	285.08	52	.....	30 00
87	35 00	10,309.9	344.14	401.49	44	December 20, 1897..	50 00
88	32 00	6,762.1	250.57	292.33	44	April 3, 1898.....	37 00
89	40 00	6,639.0	251.90	293.88	48	.....	35 00
90	40 00	9,135.5	291.84	340.48	46	April, 2, 1898.....	40 00
91	45 00	8,207.4	290.79	339.25	52	.....	40 00
92	35 00	6,009.8	234.58	273.67	50	.....	35 00
93	40 00	5,209.6	175.10	204.28	50	.....	38 00
94	45 00	7,595.1	261.22	304.75	52	.....	34 00
95	36 00	7,154.9	272.70	318.15	46	November 1, 1897..	44 00
96	50 00	7,486.6	303.31	353.86	40	December 15, 1897..	40 00
97	41 00	6,745.7	249.27	290.81	45	October 9, 1897....	37 00
98	41 00	8,135.3	327.69	382.30	48	October 22, 1897....	50 00
99	30 00	7,072.8	263.15	307.00	49	.....	*
100	40 00	6,581.6	231.19	269.72	48	November 10, 1897..	*
101	45 00	6,956.3	245.78	286.74	47	March 21, 1898.....	36 00
102	40 00	175.5	7.12	8.30	2	.....	*
103	35 00	6,745.4	284.57	331.99	45	November 15, 1897..	40 00
104	35 00	8,054.1	272.62	318.05	47	October 29, 1897....	40 00
105	35 71	6,931.6	269.10	313.95	42	December 5, 1897....	40 00
106	35 72	8,208.9	305.21	356.07	50	October 24, 1897....	47 00
107	35 00	8,004.0	296.16	347.85	50	May 2, 1898.....	40 00
108	35 71	7,679.0	285.82	333.45	49	April 25, 1898.....	40 00
109	35 71	5,820.3	216.05	252.05	46	.....	35 00
110	35 71	3,044.7	113.63	132.56	39	.....	35 00
111	35 71	2,265.2	89.40	104.30	25	.....	†
116	28 00	5,687.5	214.80	250.60	33	February 3, 1898....	32 00

\* Sold.

† Slaughtered.

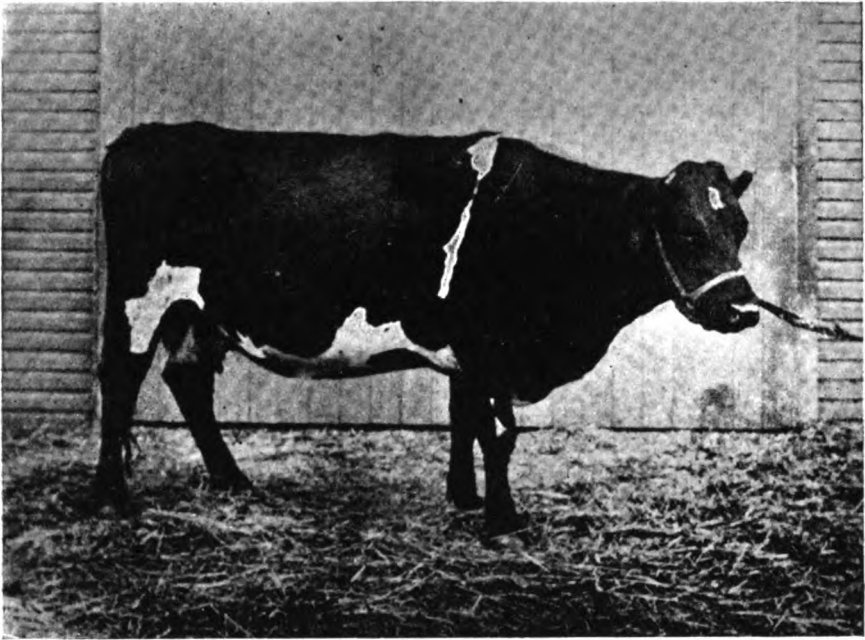


Number 102 was severely injured in the udder soon after purchase. She recovered very slowly but was finally fattened and sold for beef. Number 111 was condemned as tuberculous in April, 1898, and slaughtered. Numbers 99 and 100 were fattened and sold toward the close of their milking period because they were deemed too old to keep longer. Numbers 86, 91 and 94 gave milk through the entire year. Numbers 39, 87, 88, 90, 94, 96, 98, 101, 103, 104, 106, 107, 108, were giving milk October 1, 1898. The remaining cows had for the most part given milk through the previous winter and were dried off in August or September of 1898.

Number 110 gave bloody milk at frequent intervals, which had to be thrown away, making her record incomplete.

In determining what cows to keep for the next year attention is paid first to the records. It is significant to note that all of the cows gave over six thousand pounds of milk in the twelve months except 86, 93 and 110, throwing out of course both 102 and 111, which were disposed of before they had been in milk long enough to make any record. As far as milk giving is concerned, the average of the herd, including all the cows mentioned in the previous sentence except 102 and 111, is 7,009 pounds.

Each mess of milk was weighed as it was milked, and the quantity of fat yielded by the cow per week determined, by saving in a bottle properly marked, a small sample from each mess. A small quantity of potassium bichromate was put in the bottle at the beginning of the week, to keep the milk from souring during hot weather. Each cow had her bottle thus marked and prepared and at the end of the week the sample it contained was tested by the Babcock test and its per cent of fat determined. This bottle of milk unquestionably fairly represented in quality the average yield of the cow for the week. In a book properly ruled the weight of each mess of milk given by the cow was copied. These weights were added together at the close of the week, and the sum multiplied by the per cent of fat shown by the Babcock test, in the samples taken from the milk of the given cow during the week. The product shows the amount of fat yielded by the cow in the given week. Experience has demonstrated that it requires by the methods in use at the College on the average 257.15 pounds of fat to make, with the addition of the proper amount of salt and water, three hundred pounds of butter. A yield of 300 pounds of butter, or 257.15 pounds of fat, is a high average for a grade dairy herd over the breeding and feeding of which the owner has had control for many years. It is, therefore, a very high average for a herd hastily gathered in a season of the year when cows are scarce. Again rejecting the yields of 102 and 111, the average production of fat per cow for the twelve months was 259.91, equivalent to 304.89 pounds of butter.



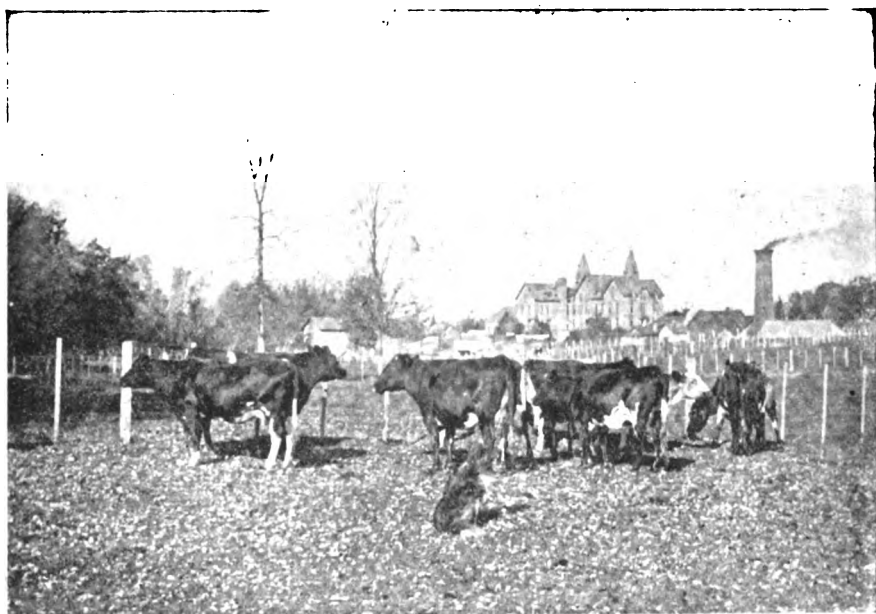
87.

The largest yield of milk was given by 87, viz.: 10,810 lbs., the next 90, with 9,135.5 lbs. to her credit. 91, 98, 104, 106 and 107 each gave over 8,000 pounds. In fat yield 87 again takes the lead, with 344.14 pounds to her credit in 44 weeks and the period of lactation not yet complete. Other cows giving over three hundred pounds of fat are 96, 98 and 106. With none of these cows was the period of lactation complete. Eleven cows out of the twenty-nine purchased, rejecting of course 102 and 111, gave less than 257.15 pounds of fat. On the other hand, number 87 gave more than fourteen pounds of butter per week both on the last week in January and the middle week of February, and 90 gave 14.74 pounds of butter in the second week of May. A fact still more significant is that 116 gave 12.7 pounds of fat the first full week of her milking period, and yet during the whole of that period, lasting thirty-three weeks, gave but 214.80. Although on the start she promised by her appearance, as well as by her yield for a single week, to be one of the best cows in the lot, she rapidly declined and was dried off at the end of the thirty-third week. She is another illustration of the danger of estimating the value of a cow from a week's test alone.

In her full milking period of sixty-three weeks number 18 gave 451.25 pounds of fat, number 39, 318.39 pounds and number 91, 321.87 pounds of fat, or 526.46 pounds, 371.45 pounds, and 375.51 pounds of butter respectively.

No reason is apparent why the herd of cows the history of which is given in this bulletin may not be supposed to fairly represent the average cows of southern Michigan, as far as their breeding and treatment

prior to their coming to the College is concerned. If their yields have exceeded the average of the cows in the herds of Michigan dairymen, it is largely because the treatment accorded them has been uniformly good. They have not been pampered and overfed for part of the season and neglected for the remainder. They have had a reasonably warm, well ventilated barn to protect them from the storms of winter. They have had succulent food whenever removed from pasture, and when, by drouth, the fields have been made bare, some forage crop has been provided to tide them over to the winter feeding. The cows have not been chased, worried nor ill treated. The high average yield of the herd is to be attributed to the combination of these factors.



COWS GIVING LESS THAN 300 POUNDS OF BUTTER IN THE YEAR.

## A DISCUSSION OF FARM DAIRY METHODS.

GORDON H. TRUE.

In a consideration of the different methods of separating cream from the milk of which it is a part, it is well to keep in mind the composition of milk. We speak of milk as being composed of water, butter fat and solids not fat. Cream consists of butter fat mixed with more or less milk. Skim milk, if the separation has been complete, consists of the water and the solids not fat of the milk. Butter fat is lighter than milk and the solids not fat are heavier, and when milk is allowed to stand there is a more or less complete separation of the lighter parts of the milk from the heavier, the butter fat coming to the top in the form of cream, while the heavier skim milk settles to the bottom. The butter fat exists in the milk in the form of minute globules varying in size from one thirty-thousandth to one ten-thousandth of an inch in diameter. The smaller the fat globules the larger the relative amount of surface when compared with the volume and the greater the resistance offered by the milk in comparison with their buoyancy. In other words, the larger the fat globules the more rapidly do they rise to the surface.

Other things being equal, the heavier the liquid in which these fat globules float the more rapidly and completely will the separation take place. In the case of milk, however, those conditions which make the skim milk heavier make it at the same time a thicker and more viscous fluid, so that with the increase in specific gravity tending to aid the separation there seems to be an increased thickness of the fluid tending to retard it. Thus it is that the composition of milk comes to have a practical bearing upon the problems of creaming.

## CREAMING.

*Shallow pans.* The method of creaming milk most commonly practiced is probably that in which the fresh milk is set in shallow tin or earthen vessels and allowed to stand at the temperature of the room until, by the action of gravity, the heavier parts of the milk find their way to the bottom of the vessel and the lighter parts come to the top in the form of cream. This method was practiced by our mothers and by our grandmothers for generations, and we speak of it nowadays as the old shallow-pan method.

While it is undoubtedly true that very good butter has been made, and is still being made, from cream raised by this process, it has its disadvantages. On account of the relatively large amount of room required for setting the milk in shallow pans, it is hard to provide a place where suitable conditions can be maintained without considerable expense. It is clear that the milk should be set in a room where the atmosphere is always pure and the temperature is under control.

It is argued in favor of the shallow-pan system that it is inexpensive. This is in a sense true, but if the same conditions of temperature and purity of atmosphere, necessary in the other methods, were insisted upon where shallow pans are used this argument could no longer be brought forward.

Too often we find that a part of the kitchen, pantry or cellar is used as a milk room, and that the use of these rooms for the cooking of food or the storage of food and of vegetables makes them unfit places for the keeping of milk. A clean, sweet, well ventilated cellar makes an excellent place for setting milk, but the kitchen or pantry should never be used. Milk is peculiarly susceptible to bad odors, and really fine butter cannot be made from milk set in an impure atmosphere.

Because of the relatively large amount of surface exposed, the cream upon milk set in shallow pans is liable to become hard through excessive evaporation unless some means are taken to prevent it. The hard cream upon the pan becomes hard lumps in the churn and these lumps, not taking color with the rest, appear as white specks in the butter. We have found that in practice it is a good plan to cover the pan with a single thickness of cheese cloth.

Not only is it essential that the air of the milk room should be pure and sweet, but it is equally important that the temperature should be under control. The lower the temperature of the room in which the milk is set the less will be the loss of the butter fat in the skim milk. In setting milk in deep cans we desire a temperature as low as 40 degrees Fah. If we could have our milk rooms at this temperature the separation of the cream would be much more complete than when set at ordinary room temperatures.

The difference between the specific gravity of the cream and that of the milk is made greater by cooling. The lower the temperature to which the milk is cooled, and the more rapidly it is cooled to that temperature, the more readily does the separation of the milk and cream take place.

By the use of the separator the cream may be taken from the milk immediately after milking. If the cold deep setting method of separation is used, the milk may be skimmed as soon as the cream has all risen, which, under the best conditions, will be at the end of about twelve hours; but in the case of shallow pans the time of skimming must be regulated by the condition of the cream. This will vary under different surroundings. Cream must have a certain degree of thickness in order to be skimmed without too great a loss from the almost unavoidable mixing of the milk and the cream during skimming. Some prefer to wait until the milk is sour. Skimming at the end of either twelve, twenty-four or thirty-six hours generally makes a most convenient arrangement of the work, and we have found it most satisfactory, all things considered, to skim at the end of twenty-four hours. The loss of butter fat would perhaps be a trifle less if the milk were allowed to stand longer and the cream were to become thicker, but the quality of the latter would not be as good. Skimming the milk while the cream is yet sweet is to be especially recommended if the product of the dairy is small and the cream has to be saved for some days in order to get a churning.

At best, the loss of butter fat in the skim milk from shallow pans is excessive. We have found that in the fall, when probably half of the

cows in the herd were "strippers," and the milk was set for twenty-four hours in a room which varied in temperature from 57 to 62 degrees Fah., with an average between 58 and 59 degrees Fah.; the butter fat in the skim milk was .66 per cent. A similar trial conducted for twenty-one days in the spring showed the same result. Here was a loss of practically one-fifth of all the butter fat. Excessive as this may seem, it is considerably below the average waste on farms where this method of setting milk is practiced. The average per cent of butter fat in the skim milk from shallow pans on seventeen farms near the college was found to be just a trifle under 1 per cent (.98 per cent). In seven cases it was above this figure, averaging 1.5 per cent, while in the ten cases where the loss was less than 1 per cent the average was .63 per cent.

*Cold deep setting.* By cold deep setting is meant that system in common use where the milk is allowed to stand in some form of deep can set or submerged in cold water. The system has its advantages over the shallow-pan method. The tank of cold water with the enclosed cans of milk does not take up much room, thus making it easy to provide a place for it where the air is pure and the ventilation good. On account of the cans being covered, the cream is never hardened on the surface, as is liable to be the case with shallow-pan cream. It is not necessary for the milk to stand more than twenty-four hours, and, remaining as it does at a low temperature, both milk and cream are sweet at the time of skimming. The ripening of the cream may then be controlled, and the skim milk fed sweet to calves or pigs. Properly handled, there is less loss of fat in the skim milk than with shallow pans. The apparatus may consist simply of shot-gun cans set in kerosene barrels sawed off to be of proper depth, a conical dipper being used for skimming, or the more convenient and more efficient and at the same time more expensive cabinet creamer may be purchased. In either case, this method is preferable to setting in shallow pans.

Three prominent agencies are suggested as affecting the efficiency of creaming—the temperature of the water in which the milk is set, the temperature of the milk itself, dependent upon the time it has been milked, and the length of time that the cows have given milk. It might be added, too, that as cows differ individually, no two being just alike in every respect, so the milk of some cows creams more readily than that of others, the difference probably being due to the difference in the composition of the milk and the size of the fat globules.

In order to get the best results from cold deep setting, ice must be used. It is important that the milk be cooled as rapidly as possible, therefore, the colder the surrounding water, the better. We have recently made trials in which the milk of the herd, divided into separate lots and set in deep cans with the water at different temperatures, gave the following results:

	Temperature degrees, Fah.	Average per- cent of fat in the skim milk
Milk set in water at.....	32-36	.19
Milk set in water at.....	40	.36
Milk set in water at.....	50	.84
Milk set in water at.....	58-60	.84
Milk set in running water at.....	58-60	.84
Milk set in open air at.....	62	1.40

These results point to the conclusion stated above, the colder the water the better. The statement is often made that water should be at least as low as 50 degrees, but our experience leads us to conclude that even 40 degrees is none too low.

Attention is called to the fact that the milk set in one case in standing water and in another in running water at the same temperature showed no difference in the efficiency of creaming. The idea seems to be prevalent that by setting milk in running water and thus keeping the temperature constant, better results can be obtained than by setting in still water at the same temperature, but this trial does not indicate that such is the case. The temperature of the standing water rose on an average 7 degrees Fah., during the twenty-four hours that the milk was allowed to set.

. It is to be observed, too, that the loss in the skim milk where milk is set in deep cans in the open air is excessive. It seems to be safe to conclude that unless water is to be used the shallow pans furnish a more efficient method of creaming than the deep setting.

While the best results seem to be obtained by setting milk as soon after milking as possible, the loss due to a slight delay in setting is not excessive if the water is at a low temperature when the milk is set. A certain amount of milk was divided into three equal lots, one of which was set immediately, one a half hour later, and the third half an hour later still, the water in all cases being at the same temperature and the milk never above 36 degrees Fah. The following are the results:

	Average per- cent of fat in skim milk.
Milk set immediately after milking.....	.216
Setting delayed half an hour.....	.25
Setting delayed one hour.....	.26

It is of the utmost importance that the water in which the milk is set be at temperature certainly below 50 degrees Fah., and preferably below 40, when the cans of milk are put in, otherwise an excessive loss of butter in the skim milk is to be expected. Setting the milk in water above 50 degrees Fah., and afterwards cooling the water down to forty or below will not prevent the loss. It is essential that the water be cold at the beginning.

The length of time the cow has been in milk has an influence upon the completeness of separation of the butter fat in the cream. The cream in milk from cows well advanced in the period of lactation seems to separate less readily than that in the milk of cows comparatively fresh. This difference is attributed to a decrease in the size of the fat globules in the milk, accompanied by an increase in the per cent of other milk solids, attendant upon the advance in the period of lactation. The smaller fat globules in a thicker fluid rise to the surface with greater difficulty.

In some half a dozen trials, in which the milk of a single fresh cow was set by itself, the skim milk showed the presence of only a trace of butter fat. At the same time there was in the herd another cow, in the eighteenth month of her period of lactation, still giving a large flow of milk. Milk from this cow set under the same conditions in an equal number of trials showed a loss of over one per cent (1.08) of butter fat in the skim

milk. When the milk of this cow was set as a part of the mixed milk of the herd, the can containing her milk showed an average loss in the skim milk of eight-tenths of one per cent (.8) of butter fat. By diluting her milk with ten per cent its weight of water, about the same loss (.81) was suffered as when mixed with the herd milk. When her milk was mixed with that of the fresh cow above mentioned the loss of butter fat in the skim milk was reduced to about a quarter of one per cent (.26).

In trials of the cold deep setting method conducted simultaneously with the trials of the shallow pans heretofore mentioned the following losses were obtained: In the fall trial when the cows were all a long time in milk and the milk set for only twelve hours in water varying from 34 to 54 degrees Fah. in temperature averaging 45 degrees Fah., the loss was a little over seven-tenths per cent (.73). In the spring trial the milk set for twenty-four hours in water varying in temperature from 41 to 52 degrees Fah., averaging 45 degrees Fah., there was a loss of a trifle over four-tenths of one per cent (.41). From these results it appears that, under what may perhaps be called average conditions as regards temperature of water, setting milk for twenty-four hours gives much better results than setting for only twelve hours. It also appears that setting milk in shallow pans for twenty-four hours gives better results than setting in deep setting for twelve hours under the conditions existing in this experiment.

It should be added that in the above trials the average loss was somewhat increased by the skim milk being drawn off too closely in a few cases. Care should always be taken to leave a certain amount of milk with the cream, as the top layer of milk always contains some butter fat. Then, too, as milk runs off from below and the cream settles toward the bottom of the can unless the flow is checked the current of milk is liable to draw some of the cream out with it.

*The separator.* The cream separator affords the most satisfactory means now in vogue for getting cream from milk. The machine consists of a very rapidly revolving bowl into which a continuous stream of whole milk runs and out of which continuous streams of cream and skim milk come. The rapid whirling of the milk serves to separate the heavier from the lighter parts, and just as the lighter cream finds its way to the top of the pan of milk when allowed to stand, while the heavier part of the milk settles to the bottom, so in the rapidly revolving separator bowl the cream finds its way to the outlet near the center of the bowl, the skim milk going to the outside. The operation is purely mechanical.

Among the advantages of the separator over the shallow pan and cold deep setting methods the following are to be considered: (1) The separation is practically complete, the loss in the skim milk being seldom more than one-tenth of one per cent, when the machine is properly handled. (2) The labor involved, it may be safely said, is less than in either of the other methods. (3) The milk is separated not only while sweet, but when warm, the cream is sweet and of even thickness, and the skim milk is in the best possible condition to feed to young stock as it comes from the separator. (4) Instead of having all the milk from the herd to keep cool, only the cream need be held at a low temperature, thus lessening the quantity of ice required. (5) The thickness of the cream may be regulated.



The main objection to the separator is the first cost. From the statements made in the foregoing pages concerning the loss of butter fat in the skim milk where gravity methods of separation are used, one who knows how much milk he gets during the year can readily calculate whether or not it will pay him to invest in a separator.

In the use of the separator three points should be carefully watched and regulated, viz.: the speed of the bowl, the temperature of the milk, and the feed of the milk to the machine. With the same machine and all other conditions the same, a greater loss of butter fat must be expected when the separator is not run up to speed, when the milk is below a certain temperature or when more than a certain amount of milk is run through in a given length of time.

With reference to the rate at which the separator should be turned, it is always safe to follow the directions given by the manufacturer for its operation.

The result of letting the speed get down was made clear by the following simple experiments: In the first case the power was removed from a machine running at full speed and full capacity, separating six hundred pounds of milk an hour, and the skim milk caught in small lots and tested separately. The following is the record of the test of the first seven quarts of milk coming from the machine after the power was removed:

	Per cent fat in skim milk.
1st quart.....	.03
2nd quart.....	.03
3rd quart.....	.045
4th quart.....	.05
5th quart.....	.10
6th quart.....	.12
7th quart.....	.16

In the second case a hand separator was turned at different rates of speed, forty-two turns of the crank per minute being recommended by the manufacturer. The following are the results:

	Per cent fat in skim milk.
45 turns per minute.....	.02
42 turns per minute.....	.04
39 turns per minute.....	.047
36 turns per minute.....	.05

In turning a separator by hand care should be taken to have the motion as steady as possible, the pressure of the hand upon the crank being the same all the way around.

For some weeks during the summer we creamed the night's and the morning's milk of the herd separately in the morning. The morning's milk, of course, was warm. The night's milk having been run over a Star Cooler immediately after milking and sometimes cooled even more by running cold water under the vat, was at a lower temperature. Separating at different temperatures gave the following results: The milk at an average of 87 degrees Fah. gave a loss of less than one twentieth of one per cent (.045 per cent), while that at an average temperature of 66

degrees Fah. showed a loss of over one-tenth of one per cent (.105 per cent). If the separating is to be done after each milking, the sooner after milking the better; if but once a day, the lower temperature the better, on account of the subsequent handling of the cream.

Hand separators are usually so constructed that the feed of milk from the supply can will not exceed the capacity of the machine if it is run up to speed. If, for any reason, the machine is run below speed or the milk is below the desired temperature for separating, the feed should be cut down accordingly.

A trial was conducted covering some twenty-three days, in which a lot of milk each day was divided into three equal parts. One part set in shallow pans, one in cold deep setting and the third separated by means of a hand separator. The cream was kept and churned separately. The conditions under which the work was done were not ideal, and the losses were greater than we get in handling larger quantities of milk. Below are given the amounts of butter made by each method from 859 pounds of milk:

	Lbs. of Butter.
Shallow pans .....	33.84
Deep setting .....	33.04
Separator .....	36.74

While the difference between the amounts made from shallow pans and cold deep setting is slight, it was in this case in favor of the shallow pans, the deep setting milk being allowed to stand only twelve hours before skimming. It will be noted that the separator gave a saving of about three pounds of butter over the other methods.

The following spring Robert B. A. Buck, '96, under our supervision, conducted a similar trial as thesis work. In this case the milk of five cows in different stages of the period of lactation was taken for the experiment. There were seven days' trial of each method, and the days upon which the different methods were tried so alternated that the advance in the period of lactation should not affect the results. The amounts of milk used in the different trials not being the same, the results may be more easily compared if the amount of butter from a hundred pounds of milk be given:

	Lbs. of Butter from 100 lbs. of milk.
Shallow pans .....	4.6
Deep setting .....	4.9
Separator .....	5.5

The difference in favor of the deep setting over shallow pans is slight. The separator again shows a good gain over both the other methods. Nearly twenty per cent more butter was obtained by the separator than by either of the other methods.

*Dilution method.* There have recently been put upon the market so-called cream separators, consisting simply of deep cans in which it is directed that the milk be mixed with a certain amount of water and allowed to stand from two to twenty-four hours, at the end of which time it is claimed that the cream will have separated completely from the milk. There is a faucet at the bottom of the can for drawing off the skim milk, and a strip of glass extending from the top to the bottom of the can allows

the operator to see that the skim milk is all drawn off. The claims for efficiency in this apparatus are based upon the theory that by the addition of water to the milk the per cent of solids not fat, and therefore the viscosity of the milk is so reduced that, upon standing, the cream will separate itself completely from the rest of the mixture in a very short time. In a two weeks' trial of a can of this sort known as the "Wheeler Cream Separator," in which about forty pounds of milk were diluted with the same amount of water at sixty degrees, and allowed to stand for twenty-four hours, the average loss of butter fat was equivalent to seven-tenths of one per cent (.7) of undiluted skim milk. Not only was the loss excessive, but the skim milk thus diluted with so much water could not be fed to advantage, and the cream soured rapidly.

#### HANDLING CREAM.

Nothing contributes more to success in butter making than the proper care of cream. Creamery men are coming to understand this; too many dairymen do not. Proper care of cream alone will not give us good butter, but good butter cannot be made from cream not properly handled. Good cream cannot come from bad milk. The care of the milk, then, is most important, as the history of the cream begins with the history of the milk. The change in milk and cream which we call souring is due to the presence and the growth of minute organisms or germs, called bacteria. Any substance or thing which is perfectly free from all forms of germ life we call sterile. Milk or cream which has been made sterile by boiling, if shut away from the air in a sterilized vessel, will never become sour as long as the air is kept from it.

Milk as it is elaborated in the udder of a healthy cow is practically sterile. Germs, however, find their way into the milk duct of the teat and, even though the bulk of the milk as it leaves the udder of the cow is free from germs, the first few draughts are loaded with them. If it were possible to avoid this contamination of the whole milk and to get the milk from the udder of the cow into sterile vessels without contact with the air, we would not be bothered with sour milk nor cream. But, as it is, these minute forms of life are everywhere present. We cannot prevent their presence, so we must adapt ourselves to circumstances and control, in so far as we can, their growth. To properly care for cream is to handle it in such a way that this growth is controlled.

There are liable to be in the atmosphere of the barn different forms of germ life, each producing its characteristic result if it is allowed to develop in the milk or cream. There are numerous forms, the result of the growth of which is simply to sour the milk; others cause a slimy condition; some produce a gas which is especially troublesome to the cheese maker; some give a bitter taste to the milk; others form different pigments, imparting a blue or red color to the milk, as the case may be, and the presence of still others is made manifest by offensive odors. All of these forms do not thrive best under the same conditions. Some require high temperatures for their development; others require low: some require air; others do not. The form which finds itself in a majority usually develops itself at the expense of others, holding them in check, if the conditions are favorable, by its own more rapid growth. The aim, then, in handling cream is to keep it under such conditions that the growth of

all germs is held in check until we desire it to ripen, and then furnish the conditions most suitable for ripening. Fortunately the acid-producing forms of bacteria are usually most abundant in the surroundings of the dairy, and they develop rapidly under conditions easily afforded them.

Just here we would emphasize the necessity of the use of the thermometer in the dairy. Good work without it is impossible.

There are three reasons for ripening cream: it churns more readily, there is less loss of butter fat in the butter milk and a higher flavor is produced. The production of flavor is the most important end sought, and because of the relation of the ripening process to the flavor it is evident that the greatest care should be taken in this part of the work.

The same general principles apply to the ripening of cream, whether it be from shallow pans, cold deep settings or the separator.

The lower the temperature at which cream is kept previous to churning, the better, on general principles, will be the results, with reference not only to flavor but to body as well. The effect upon cream of standing for some time at a high temperature does not seem to be entirely overcome by any subsequent cooling.

The higher the temperature at which the cream is ripened, the more rapidly will the ripening take place. There is a wide difference of opinion as to what is the best temperature for ripening cream, some butter makers ripen the cream at as low as 56 degrees Fah., while others use 75 degrees. In practice upon the farm neither extreme should be followed, and it will not be found best to invariably follow any fixed rule.

Where one's sole business is not the making of butter and there are other things to attend to about the place, better results will, we think, be had by ripening at the lower temperatures, say 60 degrees Fah. in the summer and 65 degrees in the winter, except in the case of shallow-pan cream.

Under these conditions the cream ripens slowly, and there is not so much danger of its becoming over ripe. About twenty-four hours will be found necessary for ripening at these temperatures.

The use of higher temperatures, say 70 to 75 degrees Fah., is to be advocated in cases where cream is off flavor on account of being held, but the cream must be closely watched that too much acid is not developed.

In the case of cream from milk set in shallow pans, it is generally sour or partly so when skimmed and does not need much ripening. Indeed, our aim should be to keep it from getting over ripe. To do this the cream should be kept as cold as possible, best 50 degrees Fah., or below, until enough has been saved for a churning, being careful to stir it thoroughly every time a skimming is added. Do not add any fresh cream to the vats for at least twenty-four hours before churning. If, as will generally be the case, the cream is sufficiently ripe when a churning has been gathered, simply raise to the desired temperature and churn. If it is still sweet, warm it up to about 70 degrees, stirring it occasionally until it has developed a pleasant acid taste or smell—twelve hours will usually be sufficient. Then cool down to the churning temperature and churn, or, better yet, cool to 50 degrees Fah. again, and after allowing it to stand at that temperature for a time, raise to the desired temperature and churn.

The handling of cold deep setting cream and separator cream is practically the same except for the fact that the separator cream leaves the machine warm and should be first thoroughly cooled to a temperature as low as 50 degrees Fah. It is then in the same condition as cream

from the cold deep setting, except that it is not so old and may therefore be held longer if necessary. In case either kind of cream is being handled it should be kept sweet until enough for a churning is gathered, and then ripened according to the general principles laid down above.

**The starter.** The use of a starter in ripening cream is to be recommended. By a starter is meant sour milk, cream or butter milk, which is added to the cream to start the ripening, just as yeast is added to the dough to make bread rise.

If one is churning as often as every day or every other day, butter milk from the previous churning may be used with good results. If the cream for the last churning was not in the best condition the butter milk from it should not be used, as the fault will thereby be reproduced.

A most satisfactory starter may be made from skim milk—best the milk from a single fresh cow—by allowing it to stand at a temperature of about 85 degrees Fah. until it is loppered. Strain enough of it into the cream to produce the proper degree of ripeness after standing as suggested above at 60 to 65 degrees Fah., for twenty-four to thirty-six hours.

Thirty-six hours is a convenient length of time to allow for ripening, as the cream may be set to ripen one morning and by the evening of the next day it may be cooled down and allowed to stand at a low temperature over night and then churned the next morning.

Perhaps it would be more proper to speak of this as allowing forty-eight hours for ripening, for the cream is certainly not ready for the churn at the end of the thirty-six hours; if it were it would be injured by standing over night, even at a low temperature.

The use of commercial starters in the home dairy is not to be recommended; not because their use would not give the best results, but because they are not needed.

We have used the commercial starters known upon the market as B. 41, Chr. Hansen's Lactic Ferment, and the Boston Butter Culture, all with good results, but their use has not given us any better butter than where the home-made starter was used.

During the winter of 1895-6 a number of trials were made in which two lots of cream were handled just alike except that in one case the B. 41 starter was used and in the other a home-made starter. Samples of the butter were sent to a Chicago commission man, who scored them without knowing their source. At the end of the trial it was found that the average scores for the different samples were practically the same.

The most accurate means for determining the acidity or ripeness of cream is furnished by what is known as the Mann's acid test, or by the use of Farrington's alkali tablets, a modification of the Mann's test. Both are simple and accurate, and their use is to be strongly recommended.

One who has had a great deal of experience in ripening cream comes to judge its condition very accurately by its appearance. The question often arises how to tell by its appearance when cream is properly ripened, but it is difficult to describe. There is a slight thickening of the cream and it has an appearance of lightness which is contradicted by a feeling of heaviness as the dipper is drawn through the vat. There is a smoothness of appearance which unripened cream does not present.

**Churning.** The churn which has no inside contrivance and in which the butter is made to come by the falling of the cream from one side to the other is the best churn. Countless churns of so-called improved pat-

terns, with various styles of paddles or disks, have been put upon the market from time to time, usually with the claim that they would bring butter in some incredibly short time. We have used a number of these churns and found that, without exception, with the cream in the same condition, it has required just as much churning to bring the butter in them as with the barrel, box or swing churn, and very often the loss of the fat in the butter milk has been increased by the sticking of the cream to some central part of the inside affair.

The churn should never be filled more than half full of cream and less than half full is better. In order to test the influence of the fullness of the churn upon the time required to get butter, and upon the loss of butter fat in the skim milk, a number of churnings were made under the following conditions: Cream of uniform temperature and ripeness was divided into three lots of ten, twenty and thirty pounds each, and churned in churns made just half full by twenty pounds. The cream was well ripened and churned at an average temperature of 52 degrees Fah. The average time required to churn ten pounds of cream was thirty-four minutes; twenty pounds of cream, fifty-six minutes, and thirty pounds, sixty-four minutes. The per cent of fat lost in the butter milk was practically the same in each case.

Reference has been made several times to the churning temperature. In answer to the question as to what is the proper temperature for churning, it is well to say: "Churn at just as low a temperature as you can and have the butter come in a reasonable time." We find that a low temperature gives a more exhaustive churning than a high temperature, other things being equal. The butter is firmer and in smaller granules. Less washing is required to get the butter milk out of the butter and the salt may be more easily distributed. Thick shallow-pan or separator cream may be churned at a lower temperature than thin deep setting cream. The thicker the cream, so long as it will fall in the churn, the sooner the butter will come and the less will be the loss of the butter fat. Do not expect the butter to come in less than thirty minutes; better churn an hour and get a good, firm butter, with almost no loss in the butter milk, than have it come in ten minutes and be soft and the butter milk rich with the lost butter fat. The proper temperature will be found somewhere below 60 degrees Fah. Our practice is to churn at 50 degrees or below in summer and not above 56 degrees Fah. in winter.

Cream from the milk of fresh cows churns more readily than that from cows long in milk. It helps matters to dilute the cream from stripper's milk with water. Butter from some cows is naturally firmer than that from others, and the cream may therefore be churned at a higher temperature.

No hard and fast law can be laid down with reference to churning temperature. One must follow the rule given above in a general way and adapt himself to circumstances.

If the butter is to be colored, and butter from most cows requires some additional color, the coloring matter should be added to the cream when it is first put in the churn. Color to suit the market, using one of the standard commercial butter colors.

The churn should be turned at such a rate of speed as to produce the most concussion. A small churn may be turned faster than a large one,

and one containing thin cream may be turned faster than one in which the cream is thick. By practice, one comes involuntarily to regulate his speed with the fall of the cream in the churn.

Churn until the butter appears in fine granules about the size of a kernel of wheat, floating well up out of the butter milk. Cold water may be added to the cream in the churn, just as it is breaking, with good results, especially if the butter is coming a little soft. If the granules form, but fail to float as they should, making it impossible to draw off the butter milk without having the butter come with it, add a little cold water; or, better, water in which salt has been dissolved, adding say a pint to a gallon of cream, generally brings the granules to the surface after only a few revolutions of the churn. *Never under any circumstance add warm water to cream in the churn.* If the churning has been carried to just the proper point the butter milk will draw off readily and but one washing of the butter will be necessary. If the churn has been stopped just a little too soon two washings may be required. Excessive washing of butter is liable to injure the flavor, and while the rule to wash until the water comes away clear is a good one to follow, on general principles, where butter is wanted for immediate consumption, a single washing will generally be more satisfactory. Clear, cold water or weak brine may be used. Fill the churn half full, turn two or three times and draw off the water immediately. It is best not to allow the butter to stand for any length of time in the wash water unless in an extreme case of soft butter, which would not occur if churned at the proper temperature. It is our aim to use wash water at about fifty degrees in the summer and at a higher temperature in the winter. If too cold water is used, the outside of the particles of butter becomes chilled while the inside remains soft, and the result is an uneven mixing of the salt when the butter is worked.

Butter may be salted in the churn, but there is the objection to it that always holds with reference to the once working of butter. The object of working is simply to distribute the salt thoroughly through the butter and expel the excess of moisture. An uneven distribution of the salt results in an uneven color, or what is commonly spoken of as mottled butter. Where butter is worked but once the operator is never sure that his butter will not be mottled. If salting in the churn is practiced, add the salt while the butter is in fine granules, and then revolve the churn until the particles adhere to one another but have not formed solid chunks; then, after allowing to stand for a couple of hours, or as long as the weather or the arrangement of the work will permit, continue the turning until the butter has come into such form as will be convenient for taking out and packing.

While it is usually preferable to work butter twice, care should be taken not to over work. Never work it until it fails to present a granular appearance when broken or pulled apart on the worker. As soon as the butter begins to hang together when it is broken off and little pin points of butter show at the break, it is time to stop working. Two or three hours should elapse between workings. It is generally more convenient to give it the second working on the following day.

Always use *dairy salt*. Care is taken in the manufacture of this salt that the granules are, to a certain extent at least, uniform in size. For this reason it dissolves more evenly in the butter. We at one time ran out

of dairy salt, but happened to have on hand a number of packages of table salt of the manufacture we had been using. For a few days the table salt was used in the dairy, and during those days it seemed almost impossible to work the mottles out of the butter. We attributed the difficulty to the unevenness of the size of the salt granules. A part of the building in which a barrel and some bags of dairy salt were stored was fumigated by the burning of sulphur. Butter salted with this salt tasted of sulphur and was practically ruined.

#### PACKING AND PRINTING

The method of packing and printing butter must be determined very largely by the trade one is seeking to satisfy. If private customers are being supplied, the aim should be to put up the butter in such form as suits them best. Always make it appear as neat and attractive as possible. The ten pound bail box makes a very convenient package; parchment paper lining and circles for top and bottom should be used. Very neat paper packages holding from one to eight or ten pounds are now on the market. These are usually made with parchment paper lining, and the circle for the top comes with the package. One of the most attractive ways of putting up butter, and the most convenient for the purchaser, is in the form of prints. For the last few years all of our butter that has not gone in tubs to the commission man, or to special customers out of town, has been put up in the form of pound prints. Each print contains sixteen ounces of butter stamped with our monogram, and wrapped first in parchment paper and then in a wooden veneer wrapper. This makes an ideal package, and without effort we have secured a trade for our butter which we have been unable to supply.

The best prices are obtained for good butter by contracting to private customers for the year. One has under these circumstances, however, to make his own collections and be responsible for regular and prompt delivery. Many prefer selling through commission men. But if the commission man is to get the best results for a patron making a small quantity, the butter must be made with such care and shipped with such regularity that not only the quality but the supply can be guaranteed to regular customers.

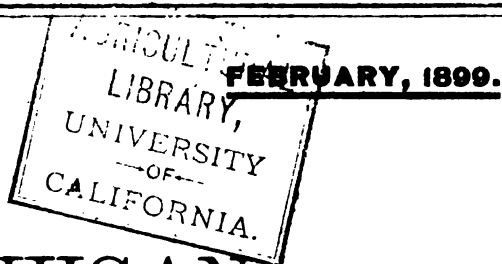
#### CLEANLINESS.

Anything upon the general subject of butter making without a reference to the care of utensils would be incomplete. Absolute cleanliness is positively necessary in all dairy work. Every article used in the dairy must be *clean*, and by clean we do not mean simply not dirty. A dipper or pan should not be called clean until it not only has every outward appearance of cleanliness but has been thoroughly scalded as well. It is our custom to first wash all utensils in warm water (not hot) then rinse in water scalding hot. Articles of tin are thoroughly steamed and then dried. Steam is not accessible on most farms. In the place of steaming, heat thoroughly about the stove or expose to the direct rays of the sun. Sunshine is a great purifier. In order to make possible a thorough cleansing of tinware, be sure the joints are all well filled with solder.





**BULLETIN 168.**



# **MICHIGAN**

**STATE AGRICULTURAL COLLEGE**

# **EXPERIMENT STATION**

**HORTICULTURAL DEPARTMENT.**

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## **MICHIGAN FRUIT LIST.**

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**BY L. R. TAFT.**

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**AGRICULTURAL COLLEGE, MICHIGAN**  
**1899**



**MICHIGAN**

**STATE AGRICULTURAL COLLEGE**

**EXPERIMENT STATION**

**HORTICULTURAL DEPARTMENT.**

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**MICHIGAN FRUIT LIST.**

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**BY L. R. TAFT.**

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**AGRICULTURAL COLLEGE, MICHIGAN  
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*The Bulletins of this Station are sent free to all newspapers in the State and to such individuals interested in farming as may request them. Address all applications to the Secretary, Agricultural College, Michigan.*

# MICHIGAN AGRICULTURAL EXPERIMENT STATION

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Grayling, Crawford County, 80 acres deeded.  
 South Haven, Van Buren County, 10 acres rented; 5 acres deeded.

## MICHIGAN FRUIT LIST.

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BY L. R. TAFT.

Letters are frequently received asking for lists of fruits of various kinds that will be of value for planting in different parts of the State. Although the State Horticultural Society publishes such a list once in two years, it is not in the hands of all fruit growers, and to supply the evident want this bulletin has been prepared. The list contains such sorts as have been found generally successful under the conditions mentioned, but as the nature of the soil has much to do with the success that will be obtained with any variety, and as this often varies on the same farm, it is not claimed that the varieties mentioned will succeed in every instance. While it is hoped that the list given will prove of value, we would recommend all prospective planters of trees to study, if possible, how the different kinds behave in orchards where the soil and surroundings are similar to those which will be used for the young trees. Several of the varieties included in the list are comparatively recent introductions and, although they have been tested in the State and seem to have much promise, we would not advise their extensive planting, but they seem to have so many good qualities that we would suggest their trial on a small scale. As new varieties are being each year brought out, some of which prove to have merit superior to those of the older kinds, we would recommend that in order to take advantage of their merits and profit by the experience of others, instead of planting them extensively, the number obtained be barely sufficient to give them a test and to secure a stock of scions and that the required number of trees, of some variety that will make a good stock, be planted in the orchard, upon which to top-work such of these new kinds as show themselves to be worthy of extensive planting. In this way several years can be gained, and the danger of loss from the use of untested kinds will be much lessened. This method is particularly recommended for apples, pears and plums. Another advantage of this method of starting an orchard is that the danger of planting trees that may prove untrue to name is greatly lessened and, when strong growing, hardy stocks are used, as should always be the case, it will not only strengthen the growth of weak growing, but otherwise valuable varieties, but will render them more hardy.

In purchasing trees, it is generally advisable, when there is a reliable nursery in the vicinity, where first-class, home-grown trees can be obtained, to secure them there rather than to purchase trees grown at a distance, but if this cannot be done, or if the price is much higher than it will cost elsewhere for a similar grade of stock, one need feel no hesitancy in sending to nurseries in other parts of the State, or even in

neighboring states, for the trees. Aside from a half-dozen or so large nurseries which grow nearly all of their stock, a greater part of the plum, pear and cherry trees, and in many cases apples as well, are grown outside of Michigan, and, even when buying from the local nursery, it will often be found that the trees are not Michigan grown.

Farmers are frequently advised not to buy their trees from traveling agents or dealers. While this advice can often be followed to advantage, there are many agents who represent reliable nurseries and, where the honesty of the agent and the standing of the nursery can be depended upon, it will often be found that trees can be ordered through the agents that will be fully as reliable as those that would be obtained directly from the nursery, and the extra price of the trees would be but little if any more than the cost of the package and express for a small order. We would, however, particularly caution against any persons who make extravagant claims for the varieties they have for sale. While it is always desirable to secure first-class, well-grown stock, there will be no occasion to pay an extra price for trees grown by some special or secret method. Although there is some difference between varieties in their susceptibility to attack by diseases and insects, no varieties have yet been obtained which, under all conditions, are entirely free, and no faith should be put upon the claims of agents who agree to furnish trees blight or curculio proof for a price considerably higher than is charged for other kinds.

In selecting varieties of any fruit for home use, it is advisable to choose a sufficient number of kinds to cover the season and, if possible, to include varieties adapted to table use in a fresh state, as well as those that are particularly valuable for cooking and canning. While selecting varieties for market purposes, this is less necessary, although with many classes of fruit it is possible to handle them to the best advantage where a number of varieties are grown that ripen in succession. The kinds selected for market should have sufficient firmness to make them good shippers and it is always advisable to have fruit of large size and high color, and an endeavor should be made to combine these qualities of the fruit with high flavor, so far as possible. In all cases hardiness and productiveness of the trees are of the utmost importance. From the following one should be able to select a list of varieties that will succeed fairly well where any kind would grow.

#### SELECTION OF TREES.

For an ordinary planter medium sized trees should be selected. It is a mistake to use three and four year-old trees, as they will be less likely to live than younger ones and at the end of two years will be no larger, if they are as large, as when smaller sizes are used. A well-grown two-year-old tree should be from four to six feet in height, with a diameter of from five-eighths to three-fourths of an inch, and with several side branches. Older trees are likely to have a long, bare stem and the roots will be cut so short that they will be less likely to start than when younger trees with a larger proportion of roots are used. Care should be taken that culls of a greater age are not substituted for the age ordered.

If possible the trees obtained should be grown on a soil of about the same nature as will be used for the orchard, as, otherwise, injurious effects may be the result, especially when the trees that have come from a nursery soil that was very rich and well supplied with moisture are placed upon a moderately light loam where the water supply is deficient. The trees will be of a soft, succulent nature, and will be subjected to a severe check when placed upon the light soil.

Some nurseries make extravagant claims for the trees that they have for sale, owing to some special stock upon which it has been propagated, but all of the larger nurseries use about the same class of stocks and naturally have adopted such as they have found by experience to give best results, and where other stocks are used, the chances are that the trees will give inferior results. For most Michigan soils, ordinary apple and pear seedlings are adapted to standard trees of those fruits. Mahaleb stocks for cherry and Myrobalan for plum are commonly used, although, upon light soils, peach seedlings are often used with success for the plum. For growing the peach, it is desirable to use pits from natural trees from Tennessee, and, when one year from bud, they are of the proper age for planting.

Peach trees are always propagated by budding, and this method is very generally used for growing pears, plums and cherries, and is the favorite method with many eastern nurserymen for propagating apple trees, while western nurserymen commonly make use of root grafting. When well-grown there is little difference between apple trees grafted upon whole roots and those for which piece roots have been used, provided they are of fair length and not more than two cuts have been made from a root. Ordinarily, the budded trees will be somewhat larger than those propagated by root grafting, and, especially if the soil in which they have been grown is deficient in plant food, they will ordinarily be more desirable, as, to grow a root-grafted tree to the proper size for planting, upon such soil, would take three or four years, while the same size would be attained by budded trees, grown under similar conditions in two or, at most, three years.

Although all of the large nurseries of the country are inspected by official entomologists, from the fact that many of our most injurious insects are of small size and are sometimes found only upon the roots, these inspections should not be entirely relied upon, although it is undoubtedly of much value to the purchasers of trees, as well as to the nurserymen themselves, in preventing insects from establishing themselves in the nursery and being scattered over the country when the trees are sold. Especially when peach trees are purchased, it is desirable to soak them thoroughly, for a short time, in a strong decoction of tobacco water, and all trees should be carefully examined for the presence of insects or diseases of any kind, and if they are detected, proper remedies should be used for their destruction.

#### CARE OF TREES WHEN RECEIVED FROM THE NURSERY.

Whether purchased direct from the growers, or ordered through agents, care should be taken that the roots of the trees are not exposed to the action of the sun and dry winds. The practice of many farmers of placing the bundles in their wagons and driving home without taking



any pains to cover them to prevent the drying of the roots has undoubtedly caused the loss of thousands of nursery trees. Wet straw and blankets should always be provided when notice has been received that the agent from whom the trees have been ordered is to make a delivery, and, as soon as possible, the trees should be either planted or heeled-in. When received in the fall, unless one has a cellar, where the temperature can be kept just above the freezing point, in which they may be placed with their roots in the soil, it will be desirable to heel-in the trees in some well-drained spot, where there will be no danger from standing water. A trench should be dug a foot or so in depth and about three feet wide, in which the trees should be placed with the tops inclined toward the south at an angle of about twenty-five or thirty degrees from the horizontal. The bundles should be opened and the soil thoroughly worked among the roots and pressed about them. It is always advisable to have the trunk and greater part of the branches covered, especially in the case of peach and other tender fruits, and whenever trees have not been thoroughly ripened. Care should be taken to have no straw or rubbish about the trees, but it is a good plan to use evergreen boughs to break the sun's rays and prevent the alternate freezing and thawing, as well as the rapid thawing of the trees after a severe cold spell. A trench should always be dug to carry off any surface water from about the trees.

#### DISTANCE OF PLANTING.

In setting the trees, the following distances will be found desirable under ordinary conditions: Apples thirty-five to forty feet; pears, standard, twenty-five feet; pears, dwarf, fifteen feet; plums eighteen to twenty feet; peaches twenty feet; cherries, sweet, twenty-five feet; cherries, sour, twenty feet; grapes, ten by ten to ten by twelve feet for strong growing sorts, and eight by eight to ten by ten feet for the weak-growing varieties; blackberries, eight by three feet to eight by five feet for large sorts, and seven by three feet for the small sorts; raspberries, seven by three feet to eight by four feet for the tall-growing varieties, and six by three to seven by three feet for the smaller sorts; currants and gooseberries, six by six feet if in squares, or seven to eight feet by five feet in the rows, and the English varieties of gooseberries as close as five by five feet; strawberries, three and one-half to four, by one and one-half to two feet, for matted row planting; and for hill culture twenty inches to two feet or two and one-half feet if arranged in squares, or three to three and one-half feet between the rows, with the plants twelve to eighteen inches apart. While the longer distances may seem a waste of room, the trees and plants, when full grown, will occupy the entire space, if given good care, on strong soil, and not only will it greatly assist in cultivating, as it will make the use of the larger tools possible, but especially in dry seasons the fruit will be much larger and better colored. Where fungous diseases are troublesome, the planting of the trees at a good distance apart will permit the entrance of the sun's rays and the circulation of the air between the trees and lessen the injury from disease. While it may be admissible under some conditions, we advise against the planting of fruits of various kinds upon the same ground. Some persons seem to think that the planting of peaches between apples,

and then setting raspberries or blackberries between the peaches, and strawberries between the rows of raspberries will effect a saving of space, but although it may be followed to some extent in the fruit garden, the practice is not ordinarily advisable in commercial plantations, as, even while the trees are small, they do not require the same care and none of them will do as well as if planted by themselves. Within a short time the roots of the trees will occupy the ground and nothing should be allowed to interfere with their growth. Even though the intermediate trees and plants are set with an idea of removing them before the trees need the space, it seldom happens that this is done until after some injury has been caused.

While we do not recommend it as a desirable practice, it will be less objectionable to plant early-bearing and short-lived varieties of apples between the rows, or at least in the rows with the trees, of slow-growing, late-bearing kinds like Northern Spy. Where the permanent trees are planted forty feet apart, it will generally be a dozen or fifteen years before there would be any very serious injury, if trees of Wagener, Jonathan and some of the other varieties were placed between them, so as to have the ground occupied by trees located twenty feet apart each way. In doing this, however, the supplying of the proper amount of plant food to make up for the increased drain upon the ground must not be neglected, and before the trees become so large that the branches interlace, the intermediate trees should be removed. If this is done, there will be comparatively little injurious effect upon the growth of the permanent trees, and the crops secured from the "fillers" up to the time of their removal should several times repay the entire cost of the orchard at that time.

#### PLANTING THE TREES.

It would be hardly possible to give too much care to the preparation of the soil for the orchard, or to the selection of the proper location for the trees. For nearly all trees a somewhat elevated site should be chosen, in order to escape extreme cold, as well as the danger of late frosts in the spring and early frosts in the autumn. There will ordinarily be much less injury from fungous diseases if the trees are placed in elevated, rolling sections, than in low lands or hollows.

The soil should be of a nature adapted to the particular fruit to be grown, peaches generally doing better than most other fruits on comparatively light soils, while in the order named, cherries, apples, pears, and plums would require heavier soils, and, where all of the above fruits are to be planted, a similar arrangement, as to the elevation upon which they are placed should be made, peaches being placed on the higher levels and plums upon the lower.

For every kind of fruit a considerable amount of humus is desirable in the soil, and this can often be secured by turning under clover, field peas and other crops. If the land is deficient in plant food the use of decomposed manure will often be advisable, although care should be taken not to use an excess in the case of peach trees, as it would very likely result in a late growth and the winter-killing of the trees. After having plowed and thoroughly dragged the land, it should be marked out at the proper distances and holes dug for the trees. In some cases a plow can be used to good advantage to aid in digging the holes. The holes should

ordinarily be of a depth that will permit of planting the trees slightly lower than they were in the nursery and of such a size as to take in the roots without cramping or bending. If the soil at the bottom of the hole is either very poor or very hard, it is advisable to remove an inch or two more and fill in with the best of the surface soil. In planting the trees the fine soil should be carefully worked among the roots and packed about them.

#### PRUNING THE TREES.

If the roots of the trees are broken, all injured or bruised portions should be cut away, and if, as is sometimes the case, there is a mass of dry, fibrous roots, these also should be removed. After planting the trees, the tops should be pruned by the removal of the surplus branches and cutting back the others. For apple, pear, plum and cherry trees, it is desirable to leave about four side branches, cutting them back to the length of four to six inches, with a center shoot that will be somewhat longer. If the trees are one year old, and unbranched, it is only necessary to cut off the stem at a point six or eight inches above where the branches are desired. In the case of peach trees, which have formed numerous side shoots, four of the stronger branches should be cut back to about two buds and all others removed. Where there are only a few side branches and a number of strong buds upon the main stem, the side shoots may be cut off and new branches formed from the undeveloped buds on the trunk, but in the case of large trees, on which all of the buds upon the trunk have developed into branches, the trimming to a whip, as is often recommended, is not advisable. If shoots start at all, they are likely to be small and misshapen and at points where they are not desired.

#### APPLES.

As a collection for family use, the following varieties are suggested: Yellow Transparent, Bough (Sweet), Oldenburg (Duchess), Primate, Gravenstein, Chenango, Maiden Blush, Shiawassee, Wealthy, Bailey (Sweet), Jonathan, Wagener, Hubbardston, Grimes, Baldwin, R. I. Greening, Red Canada, Northern Spy, Talman and Golden Russet. Among other kinds that generally do well, and in certain sections are of even more value than some in the above list, are Red Astrachan, Tetofski, Early Strawberry, Colvert, Porter, Fall Pippin, Oakland, Peck (Pleasant), King and Stark.

As market varieties nearly all of the kinds given in the first list will be desirable in their season, but as there is only a small demand for the summer and early fall varieties, comparatively few should be planted, except where the large cities can be readily reached and then such kinds as Yellow Transparent, Oldenburg and Shiawassee will generally be found profitable. In some sections Twenty Ounce does remarkably well, and for such locations it will be found a desirable market sort.

Of the other varieties mentioned, Jonathan is one of the most desirable, but it requires good care to bring the fruit to its full size. Baldwin should also be extensively planted in elevated sections and on well-drained soil. The trees are sometimes winter-killed upon low, wet land. Northern Spy, Hubbardston, Grimes and Red Canada are also valuable market sorts. Red Canada is a weak tree, but when top-worked upon

some strong variety, is usually productive. Northern Spy has the serious fault of being a long time in reaching a bearing age, but the trees are hardy and long-lived, and the size and quality of the fruit render it especially valuable. In some states Ben Davis fruit is of a large size and fair quality, and as the trees are hardy and quite productive, it is a leading market sort. As grown in most parts of Michigan, however, it is somewhat smaller and of comparatively inferior quality, but many persons have found it among the most profitable sorts. Wagener is an early bearing, very productive variety, and unless the trees have excellent care, and are thinned while young, they soon become exhausted and die. With proper care it is one of the most valuable kinds for either home use or market purposes, for the northern half of the State.

Of the other hardy kinds, Yellow Transparent, Tetofski, Shiawassee, Gravenstein, Wealthy, St. Lawrence, Pewaukee, Stark and Wolf River have been most thoroughly tested, and all of them have much merit for sections where ordinary varieties would fail. When the Russian varieties were introduced, it was hoped they would prove particularly valuable for the northern half of the State, but most of them ripen during the summer, or early fall, and they seem especially subject to the attack of twig blight, which renders many of them utterly unfitted for the colder portions of Michigan. Antonovka, Bietigheimer, Borovinka, Hiberna, Longfield, Switzer, Titovka, Thaler, Cross and Gypsy Girl have given best satisfaction.

#### PEARS.

For the home orchard, the following varieties can be used, the number of the earlier kinds being comparatively small, while those ripening during the early fall will generally be most desirable, as they will be largely used for canning purposes. Of the early varieties Summer Doyenne, Osband, Bloodgood and Elizabeth (Manning) will generally prove satisfactory. For fall, use Clapp, Sterling, Boussock, Bartlett, Flemish (Beauty), Howell, Bosc, Mt. Vernon, Seckel, and Sheldon; among the desirable winter kinds are Anjou, Clairgeau, Lawrence, Dana Hovey, Winter Nelis and Easter (Beurre). These varieties succeed well as standards, but some of them, such as Anjou, Seckel, Bartlett and Howell, may be grown as dwarfs. Angouleme (Duchess) and Louise Bonne are also valuable sorts and should always be grown upon quince stocks. Of the kinds best adapted for market purposes, Bartlett should be placed well at the head, as it is generally a productive variety. Howell, Anjou, Lawrence and Angouleme are also valuable varieties for the market orchard. Although quite subject to blight and rotting at the core, Clapp is found desirable in some sections, while in others Flemish succeeds well, but not without thorough spraying, as it is usually much injured by leaf blight and scab.

For the southern half of the State, Keiffer is a productive variety, and when the fruit is properly thinned and ripened in the house, it is a fair variety for canning purposes. While its firm and coarse flesh is objectionable in one way, it renders it especially valuable for shipping. In some sections Seckel can be grown to a fairly large size by thorough cultivation and proper thinning, and as the fruit can be kept in cold storage for six or eight weeks, it will generally bring a good price, if thus

handled. The late winter varieties when carefully picked, wrapped in tissue paper and placed in the cellar where the temperature can be kept at from 35 to 40 degrees, will often keep until spring.

Of the new varieties, Vermont Beauty is promising as a late summer sort, as it is quite productive and the fruit is handsome and of excellent quality. Wilder (Early) is also a valuable sort. Worden-Seckel, although not generally tested, will undoubtedly have much merit as a variety, both for home use and market, as it is equal to its parent, Seckel, in quantity and considerably exceeds it in size.

#### PLUMS.

For the most part, the varieties adapted for home use will be found desirable for market. Of these, in about the order of their ripening, are Field, Bradshaw or Niagara, Lombard, Pond, Imperial Gage, Italian Prune, Prince Englebert, Quackenboss, Kingston, Grand Duke, Black Diamond, Monarch, Stanton, Bavay, Shropshire and Golden Drop. Of the Japanese sorts Abundance, Burbank, Red June, Red Nagate, Satsuma, and Wickson have been tested and found of value.

The early European varieties are frequently attacked by brown rot, and the crop is sometimes ruined, and, as the canning season seldom begins before the first of September, the demand for them is usually comparatively small and prices rule low. Lombard has usually been considered one of the most productive and profitable varieties, but this has resulted in its being extensively planted, and, as a consequence, the markets are flooded and it has to be sold at a low price. For market purposes, the large, late, dark red or purple varieties seem most profitable and among them Grand Duke, Black Diamond and Monarch have the most merit. Where one has large numbers of Lombard and other strong growing, early varieties, the top-working of the trees with some of the late kinds above mentioned will generally be desirable.

The Japanese varieties start early in the spring, and the flowers are more likely to be injured by the late frosts than those of the European sorts. Several of the varieties ripen quite early, before the European kinds are on the market, and frequently bring a good price, but, as the market would soon be overstocked, the extensive planting of the early Japanese kinds cannot be recommended. Satsuma is generally productive and the fruit is excellent for canning purposes, but the dark red flesh is not particularly attractive and, until its merits have been learned by the public, it probably will not have an extensive sale. Wickson is an early-bearing, productive sort and will probably succeed wherever the peach can be grown. The fruit is quite large and of very fair quality. Its season is about the first of September.

#### PEACHES.

Whether for home use or market, it is desirable to have such a selection of varieties as will cover the season of this fruit. Alexander, Triumph, Hale, Rivers, Early Michigan, Lewis, St. John, Early Crawford, Barnard, Engle, Fitzgerald, Hills Chili, Elberta, Kalamazoo or New Prolific, Crosby, Late Crawford, Beers Smock, Stevens Rareripe, and

Salway. As a rule, the earliest varieties are small and cling-stones, and the demand will be comparatively small. Previous to the ripening of Early Michigan and Lewis, there is no kind that takes high rank as a dessert or cooking variety. Early Crawford is one of the best known kinds and is fairly reliable upon strong, heavy soil in elevated sections, but upon sandy loam soil, and near the lake shore, its buds are likely to be winter-killed. Elberta is a large and handsome peach, and the trees are early and productive bearers when not injured by leaf curl, and, as this can be readily controlled, it should not be dropped from the list. This variety is also valuable as a market sort, on account of its excellent shipping and keeping qualities. Kalamazoo and New Prolific, although somewhat injured by leaf curl, are usually quite productive and their handsome appearance and high flavor make them valuable in any list. Crosby is one of the hardiest varieties in cultivation and often gives a crop in sections where other varieties fail. When the trees are well cared for and the fruit is properly thinned, it attains a fair size.

Among the new kinds that have not been generally tested, Triumph is well worthy of trial. Although it would rank as a semi-cling, it is about two weeks earlier than any other yellow peach, and as the trees are early and profuse bearers and the fruit is attractive and of good quality, it will undoubtedly take the place of the Alexander and the other early, white-fleshed kinds in the market. When the fruits are thinned so as to be at least six inches apart on the trees, they reach a fair size, Fitzgerald is a valuable kind to follow Early Crawford in the market, and wherever tested, it seems to be one of the most hardy and productive varieties. It is a yellow peach of good size, attractive appearance and good flavor. Although not especially desirable as market varieties, Mountain Rose and Oldmixon are fairly hardy, productive and of good quality and are worthy of place in orchards for home use.

#### CHERRIES.

For most parts of the State, the sour varieties of cherries will be found most desirable both for home use and market. While the sweet cherries do well in many sections, and when well grown are a very valuable fruit on account of their large size and superior quality, the trees in other sections are often injured by the bursting of the bark upon the trunk and larger branches and, as a result die, they seldom attain their full size. The fruit, too, is often injured by brown rot and the blossoms are often destroyed by late spring frosts. For these reasons it can be seen that the sweet cherries are far less reliable than the sour varieties.

Of the sour cherries Richmond, Montmorency and English Morello will be found generally reliable, and as they ripen in succession, they will cover the greater part of the season. May Duke and Late Duke are also fairly productive, and the fruit of these varieties is larger and less acid than that of the kinds above mentioned. Brusseler Braune and Wragg are two varieties that have been grown in the State for the past ten or twelve years, and seem to be preferable to English Morello, as the fruit is larger, later and has longer stems than those of that

variety. The trees are also rather stronger, better growers, and are fully as productive.

Of the sweet varieties, Early Purple, Gov. Wood, Bigarreau (Yellow Spanish), Napoleon, Rockport, Elton and Windsor are most generally successful. The bursting of the bark of these varieties can be lessened by the use of cover crops during the winter while the trees are young, and, later on, seeding the land to clover or grass. If the soil is fairly rich and supplied with moisture, it will have little if any injurious effect and will benefit the trees by checking their tendency to make a strong growth.

#### GRAPES.

The list of grapes for home use or market purposes differs but little from that recommended in the previous fruit list. Concord is still the leading black variety, while Worden has come rather more prominently into notice, as it is somewhat earlier than Concord and less likely to be injured by early frosts in the fall. Moore is still somewhat grown as an early black sort. Although not fully tested in Michigan, Campbell (Early) is well worthy of trial, as the plants seem unusually strong, hardy and free from disease, while the fruit is of large size, both in berry and cluster, and ripens a week or ten days earlier than Concord. The pulp is tender, separates readily from the seeds, and is of excellent quality. The vines seem to be very productive, and as the fruit is said to hang a long time without dropping, it is probable that it will be an excellent shipping and a long-keeping variety.

Of the red grapes Delaware is most extensively grown, and, where it has a suitable location and good care, it is one of the most productive varieties. Although the fruit is small, the superior flavor of the pulp makes it one of the most valuable of table grapes. Brighton is less generally successful, but it has much merit as a variety for home use or local market. Salem is also highly prized and Vergennes and Diana are somewhat grown, owing to the fact that they have superior keeping qualities.

McPike is a new variety that has much promise. In a general way, the same claims are made for it as for Campbell and, judging from the appearance of the foliage and fruit, they can be easily substantiated. The vines are said to be very hardy, healthy and productive, and the fruit is attractive in appearance and of excellent quality.

Winchell, Diamond and Niagara are the best white varieties and cover the season fairly well. Winchell is a hardy, productive and early sort, and although its clusters are small, the fruit is of good quality. Diamond has much larger clusters and is one of the handsomest varieties grown. Niagara has been quite extensively planted as a market sort, and when well grown, generally brings a slightly higher price than can be secured for the black and purple varieties.

#### CURRENTS.

While the large-fruited varieties, such as Cherry, Fay and Versailles have much merit, where they can be grown to perfection, their canes are so injured by the currant borers that they are seldom profitable, and Red

Dutch, Victoria and Prince Albert are generally preferred. While these kinds are not free from the attack of borers, they are much less injured than kinds with a large pith. The last is desirable as a late variety and it has the additional merit of being little injured by currant worms.

Of the new varieties, Pomona and London Market are very promising. They have fruit of good size, arranged in long clusters, and the plants seem to be quite productive. As yet they have not shown much injury from the currant borers. Red Cross is a strong-growing plant, but the canes seem to be much injured by borers. While the berries are of large size, the clusters upon the young plants seem to be rather short. White Grape is still the leading variety of its color, although White Transparent has probably some merit. There is little choice between Black Naples, Black Champion and Lee, of the black varieties.

#### GOOSEBERRIES.

Under ordinary conditions, the best results will be secured from varieties of American origin. Downing is still most extensively grown, but Pearl and Champion seem to have all of its good points, and are slightly larger in size and fully as productive. The English varieties are much injured by the powdery mildew, but if the bushes are planted in cool, moist soil, where they will have a free circulation of air, and are pruned so as to form a rather open head, there will be little trouble from the disease, when the bushes are thoroughly sprayed with liver of sulphur.

Industry is best known among the varieties of this species, but it is less desirable than Keepsake, Chautauqua, Lancashire Lad and Columbus. When properly handled, these varieties are quite productive, and the large size, juicy pulp and superior quality of the berries make them in every way more desirable than the improved kinds of American origin.

#### RASPBERRIES.

Hansell and Marlboro are among the best of the old varieties that ripen early in the season, while Miller and King are among the more promising of the new kinds. Cuthbert has as yet no superior for the main crop, although London surpasses it in hardiness. The latter variety is a very promising sort upon rich soil, as, although the plants are of rather weak growth, they are productive and the fruit is of large size, quite firm and of very good flavor. Brandywine is in some sections highly esteemed as a market sort, and Golden Queen as a variety for home use.

Of the black varieties, Palmer, Conrath, Eureka and Kansas form a desirable list. Onondaga, Cumberland and Munger are promising new varieties. Shaffer and Columbian are strong-growing, productive sorts of the purple cane class, but, owing to their tendency to crumble, as well as their somewhat unattractive color and flavor, they do not take well as market sorts, except with persons who are familiar with their merits as canning varieties.



## BLACKBERRIES.

Snyder and Taylor are among the hardiest and best blackberries, the latter having rather larger fruit than Snyder. Erie, Eldorado and Minnewaski also have some merit. Early Harvest and Wilson are productive varieties, and valuable if they can have winter protection.

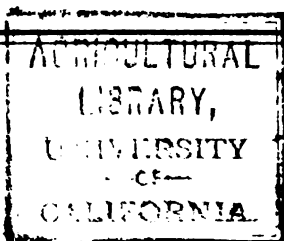
## STRAWBERRIES.

Among the better varieties for home use or local market are Warfield, Haverland and Clyde, while Bubach, Parker Earle and Brandywine will do well with intensive culture. For growing upon strong soil, where there will be an abundance of moisture and plant food, Marshall, William Belt and Glen Mary may be selected. Of the new sorts Carrie seems to have some claims as a substitute for Haverland, and Ruby, Margaret and Mayflower are also promising sorts, while Fountain, Hoosier, Knight, Morgan Favorite, Ridgeway, Seaford and Michigan have much merit.

L. R. TAFT.

Agricultural College, Mich., February 15, 1899.

**BULLETIN 169.**



**FEBRUARY, 1899.**

# **MICHIGAN**

**STATE AGRICULTURAL COLLEGE**

## **EXPERIMENT STATION**

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The Bulletins of this Station are sent free to all newspapers in the State and to such individuals interested in farming as may request them. Address all applications to the Secretary, Agricultural College, Michigan.

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## SUB-STATIONS

Grayline, Crawford County, 80 acres deeded.  
 South Haven, Van Buren County, 10 acres rented; 5 acres deeded.

**NOTES FROM THE SOUTH HAVEN SUB-STATION.**

BY L. R. TAFT AND T. T. LYON.

Nearly ten years ago the Board of Agriculture, realizing the importance of the fruit industry of Western Michigan, established a fruit testing sub-station at South Haven, in order that the growers of that section might be informed as to the varieties likely to thrive with them, as the climatic conditions at the main station near Lansing are quite different from those that prevail on the lake shore. The charge of the work was placed in the hands of T. T. Lyon, at that time President of the State Horticultural Society, and who has for many years had a national reputation as an expert pomologist. The work has been conducted in a satisfactory manner under the direction of Mr. Lyon, and at the close of each season he has presented a complete report of his operations with notes upon varieties under test. This has been published as a bulletin and has had a wide circulation. During the past year Mr. Lyon's health has failed, and although he was able to direct the work, he did not feel that he could prepare the report, and that the public might not lose the results secured during the season, the writer has undertaken to compile the report from notes prepared by Mr. Lyon and his assistants. The task has been greatly lessened by the completeness of the notes, and by the occasional visits that have been made to the station each year since it was established. For two years specimens of all of the new varieties have been sent here that they might be photographed, and descriptive notes were also taken of them. This greatly aided the preparation of the bulletin.

**EXPERIMENTS IN SPRAYING.**

Aside from the applications required to control the insects and diseases, various experiments to determine which materials were most satisfactory and the best time to apply them were undertaken. For use as fungicides, Bordeaux mixture and solutions of copper sulphate of various strengths were tested. It has been thoroughly demonstrated that, for use after the foliage has started, Bordeaux mixture is the most satisfactory fungicide that we now have, but for the treatment made previous to the opening of the buds, fully as good results have been reported from the use of a solution of copper sulphate, at the rate of about one pound to fifteen gallons of water, and in order to satisfy ourselves fully upon this point, arrangements were made to spray a portion of the pear and apple trees with the copper sulphate solution and others with Bordeaux mixture of the usual strength, (four pounds copper sulphate, four pounds lime and forty gallons of water). As the plantation contains two trees of each variety, we were able to test

the matter upon a large number of kinds. The spraying was given upon the 12th of April, the 2nd and 27th of May, and the 16th of June. Other applications of Bordeaux mixture were made to all of the trees. As a result of this thorough spraying, no scab or leaf blight appeared upon any of the trees, although unsprayed trees were badly affected. Examination at frequent intervals to compare the effects of the spraying with the copper sulphate solution with those secured with Bordeaux mixture, showed no difference whatever, and from the fact that the solution is less expensive as well as being easier to prepare and apply. it is to be recommended for the early spraying in preference to the Bordeaux mixture. The use of the application made during the dormant period of the trees is to destroy the mycelium and spores that have wintered upon the branches and for this purpose it is not strange that the copper sulphate gives fully as good if not better results than Bordeaux mixture. On the other hand, the applications made after the growth has started, are designed to prevent the germination of the spores that fall upon the young growth. From the fact that it is possible to use only a very weak solution of copper sulphate and that this is readily washed from the trees, Bordeaux mixture would naturally give better results, as it can not only be used of a strength several times greater than would be safe with a clear solution of copper sulphate, but the lime holds it for a long time upon the foliage and makes it possible to destroy any of the spores that fall upon them so long as it remains. The importance of thorough spraying will also be recognized, since, if any of the leaves or even portions of the leaves are not reached with the spraying mixture, there will be no effect in stopping the entrance of the germs.

One of the most troublesome diseases of the peach is commonly known as leaf-curl. Although of a fungous nature it seldom appears except during the spring and early summer of seasons when the weather is cold and wet.

For several years this disease has been quite troublesome in the orchards about South Haven, and in many instances the entire crop has been lost as a result. As long ago as 1892 the peach trees upon the sub-station grounds at South Haven were sprayed with fungicides and the results indicated that the disease could be prevented. Since that time the sprayings have been repeated nearly every year, and good results have been secured. In the spring of 1898, arrangements were made to test the effect of early with late spraying applications. One tree of a variety, of nearly one hundred kinds, was sprayed on the 25th of March, with Bordeaux mixture and on the 23rd of April another of each variety was sprayed. At that time, although the buds were much swollen, they had not opened. On the first appearance of the foliage, a marked difference was observable upon the two lots of trees, as where the spraying was done in March, comparatively few leaves were attacked, and in no case was it sufficient to reduce the crop, while on the trees sprayed April 23rd, a considerable amount of curl was observable, but much less than upon other unsprayed trees. Upon the 23rd of May all of the trees were treated with Bordeaux mixture, and Paris green was added at the rate of three ounces in forty gallons for the destruction of curculio and other insects. While the weather during the early part of the season was very favorable to the development

of the leaf curl, the warm and comparatively dry weather that followed the blossoming of the trees checked further development and little if any benefit could be detected from the second spraying, so far as the leaf curl alone was concerned. Its use, however, was undoubtedly profitable in preventing the spread of brown-rot and the attack of leaf eating insects. With varieties subject to attack of brown-rot, a second application of Bordeaux mixture can generally be made with profit, and if the weather is favorable for its development, it will often be advisable to spray the trees with a solution of copper sulphate, at the rate of one pound to two hundred and fifty gallons of water, when the fruit is two-thirds grown. If the unfavorable conditions continue, another application of the copper sulphate solution should be made, within ten days.

The arsenites having been used upon all of the fruit trees in connection with Bordeaux mixture, the leaf-eating insects were readily held in check, but some trouble was found from the attack of black and green plant lice, especially upon the cherry and plum. For this a strong decoction of tobacco water was used and where any survived the first application, a second was made within a few days.

The woolly aphid having made its appearance on some of the apple trees, a bushel of wood ashes was scattered about each tree to destroy the form that infests the roots and the tops were at the same time sprayed with kerosene emulsion. This proved an effectual remedy, but in sections where wood ashes cannot be readily secured, tobacco dust upon the roots gives fully as good if not better results. The action of the dust can be hastened if the soil is scraped away about the trees down to the roots and replaced after the tobacco dust has been applied.

## STRAWBERRIES.

As stated in the report of last year, the fifteen acres occupied by the sub station is now practically covered with fruit trees and the bush fruits. A small area was planted in 1897 to strawberries, but no planting was made in 1898, as it was thought best, under the crowded condition of the land, to discontinue further tests of this fruit at the sub-station, relying upon the tests made at the Agricultural College. The tabular notes and the descriptions that follow have been made from the plantation of 1897. The fruit was set, as in previous years, so as to give each plant a space of about eighteen inches, and while one-half of them were kept in hills, the others were allowed to form narrow matted rows. Thorough cultivation was given during the season, as in the fall oats were sown between the rows to provide a winter mulch. The oats were sown about September first, and made a fair growth during the fall. The tops were killed during the winter, but with the mild climate at South Haven many of the stools were able to send up shoots in the spring, and made additional work necessary in order to prevent their growth. While oats may answer well in other sections, this liability to pass the winter and grow in the spring makes the crop of doubtful value along the lake shore.



## TABULATION OF STRAWBERRIES. 1898.

ABBREVIATIONS—n, nearly; p, pistillate; c, conical; co, compressed; l, irregular; l, long; o, oblate; ob, oblong; r, round; b, bright; c, crimson; d, dark; l, light; s, scarlet.

SCALE—1 to 10; 1, feeble; 10, very vigorous.

Names.	Sex.	Vigor (1-10).	Date bloom.	Date first pick- ing.	Date last pick ing.	Productiveness scale (1-10).	Form.	Color.	Quality (1-10).	Texture (1-10).	Weight (oz.).
Aoom	b	10	May 6	6 6	6 29	10	er	ls	6	6 7	1/2 to 1/4
Annie Laurie	b	8 9	" 19	6 11	7 2	5 6	ror	bs	5 6	7 8	1/2 to 1/4
Arkansas Traveler	b	9 10	" 12	6 10	6 30	9 10	cico	s	3 4	5 6	1/2 to 1/4
Aroma	b	7 8	" 13	6 11	7 2	9 10	reico	ds	4 5	4 5	1/2 to 1/4
Arrow	p	10	" 8	6 11	7 2	9 10	er	ds	6 7	5 6	1/2 to 1/4
Auburn	p	8 9	" 13	6 11	6 30	9 10	eri	ds	7 8	8 9	1/2 to 1/4
Avery	p	8 9	" 4	6 10	7 2	10	ci	ds	4 5	4 5	1/2 to 1/4
Beauty	b	7 9	" 4	6 12	7 2	10	cico	ds	5 6	6 7	1/2 to 1/4
Beecher	b	9 10	" 11	6 11	6 30	7 8	ro	c	5 6	4 5	1/2 to 1/4
Belt 3	b	7 10	" 8	6 14	7 2	7 8	ci	bs	5 6	6 7	1/2 to 1/4
Beverly	b	5 9	" 6	6 9	6 3	6 8	erci	ds	7 8	8 9	1/2 to 1/4
Bickle	p	6 7	" 8	6 9	7 2	9 10	rc	s	5 6	5 6	1-5
Bob Bubach (3353)	b	3	" 9	6 12	6 27	12	rei	s	5 6	7 8	1/2 to 1/4
Bonner	b	5 6	" 9	6 13	6 30	9 10	rei	ds	7 8	6 7	1/2 to 1/4
Brandywine	b	7	" 13	6 9	7 5	6 7	reio	ds	7 8	10	1/2 to 1/4
Brunette	b	7 8	" 14	6 9	7 2	7 8	rei	ds	9 10	9	1/2 to 1/4
Bubach 5	p	6 7	" 13	6 9	7 2	10	recoi	s	5 6	5 6	1/2 to 1/4
Carnot	b	4 5	" 8	6 14	6 30	4 5	lcooi	ds	5 6	5	1/2 to 1/4
Carrie	p	5 7	" 9	6 13	7 2	5 7	cooi	bs	4	5 6	1/2 to 1/4
Carrie Crescent	p	3 4	" 13	6 13	6 20	2	coo	ds	4 5	4 5	1/2 to 1/4
Chairs	b	4 5	" 4	6 11	6 30	8 10	roi	ds	5 6	5 6	1/2 to 1/4
Champion	b	5 6	" 8	6 13	7 2	7 8	cobco	ds	5	4 5	1/2 to 1/4
Champion (Eng.)	b	6 7	" 11	6 10	6 30	5 6	recoi	s	4 5	7 7	1/2 to 1/4
Charley Crescent (2097)	b	2 3	" 9	6 13	6 23	2	r	c	4 5	5 6	1-5
Charlie	p	7 10	" 13	6 11	7 2	8	c	ds	5 6	7 8	1/2 to 1/4
Cheyenne	p	1 2	" 16	6 13	6 27	12	recoi	s	6 7	5 6	1/2 to 1/4
Cobden Queen	p	9 10	" 13	6 13	7 2	5 7	rrei	bs	4 5	6 7	1/2 to 1/4
Columbia	b	5 7	" 8	6 11	6 29	5	loi	bs	5 6	5	1/2 to 1/4
Columbian	b	8 9	" 9	6 13	7 2	5	reo	bs	4 5	3 4	1/2 to 1/4
Crescent	p	8 9	" 9	6 6	7 2	8 10	ror	s	5 6	5 6	1-5
Cruse	b	4 5	" 9	6 8	6 29	4 5	croco	ls	6 7	8 9	2-5
Curtis 15	b	9 10	" 7	6 8	7 2	9	reco	s	6 7	5	1/2 to 1/4
Curtis 159	p	6 7	" 11	6 8	6 30	6 7	reco	ds	5 6	7 8	2 1/2 to 1/4
Cyclone	p	9	" 6	6 7	7 2	7 8	cooi	ls	6 7	5 6	1/2 to 1/4
Daisy	p	7 8	" 9	6 1	6 29	9 10	roo	ds	7 8	8 9	1/2 to 1/4
Dan Bissel	b	8 9	" 9	6 8	7 2	7 8	recoi	bs	7 8	8	1/2 to 1/4
Dayton	b	5 6	" 12	6 10	6 29	6	cooi	s	6 7	4 5	1/2 to 1/4
Delta	p	8 9	" 19	6 13	7 2	7 8	orc	bds	7 8	5 6	1/2 to 1/4
Dollar	p	6 7	" 12	6 16	7 2	5 6	reico	s	4 5	6 7	1/2 to 1/4
Earliest	b	8 9	" 8	6 6	6 29	7	coo	s	6 7	9 10	1-5
Early Jack	b	5 7	" 2	6 9	6 29	8 9	ror	ls	5 6	4 5	1-5
Edgar	p	9	" 14	6 13	7 2	7 8	rreo	ls	4 5	4	1/2 to 1/4
Edith	p	3 5	" 13	6 12	6 30	4 5	recoi	ls	7 8	6 7	1/2 to 1/4
Edwards	b	3	" 13	6 15	6 25	4 5	rci	ls	5 6	4 5	1/2 to 1/4
Edwards (Fav.)	b	6 7	" 17	6 16	7 5	4 5	cico	ds	7 8	7	1/2 to 1/4
Eleanor	b	6	" 13	6 11	6 30	6	cro	ds	7 8	7 8	1/2 to 1/4
Bobanoe	b	7 8	" 13	6 15	7 2	8	orc	ds	7 8	9 10	1/2 to 1/4
Epping	p	8 9	" 13	6 11	6 30	7 8	cooi	s	6 7	4 5	2-5
Equinox	b	7	" 13	6 15	6 30	8 9	cooi	c	6 7	7 8	1/2 to 1/4
Eureka	p	7 8	" 13	6 13	6 29	5 6	recoi	ls	6 7	4 5	1/2 to 1/4
Evans	b	5 7	" 9	6 13	7 2	5	ro	s	4 5	2 3	1/2 to 1/4
Faux	b	6	" 8	6 11	6 29	4 5	cco	ds	7 8	5 6	1/2 to 1/4
Fifer, Gov.	b	7	" 10	6 15	7 2	5	rreo	s	4 5	4 5	1/2 to 1/4
Fir	b	7 8	" 9	6 17	6 30	5 6	lcro	bs	7 8	5 6	1/2 to 1/4
Fountain	b	10	" 8	6 6	6 29	10	cco	ds	7 8	5 6	2-5

TABULATION OF STRAWBERRIES, 1893—Continued.

Names.	Sex.	Vigor (1-10).	Date bloom.	Date first pick- ing.	Date last pick- ing.	Productiveness, scale (1-10).	Form.	Color.	Quality (1-10).	Texture (1-10).	Weight (oz.).
Fremont	b	5	May 11	6 15	7 2	5	r r c o	s	4 5	4 5	1/2
Gardner	b	7 8	" 8	6 17	6 30	5 6	l c r c	d s	7 8	5 6	2 1/2
Giant	b	7	" 4	6 6	6 29	10	c o c o	d s	7 8	5 6	2 1/2
Gipsy	p	7	" 8	6 10	6 29	7	c o c o	d s	7 8	5 6	2 1/2
Greenville	p	7	" 12	6 16	6 29	6	o b c o m	l c	5 6	5 6	2 1/2
Haights	b	7	" 8	6 9	7 2	5 6	c	s	4 5	4 5	1/2
Haverland	p	8 10	" 8	6 9	6 30	9	l c	b s	8 9	7 8	1 1/2
Hersey	p	8 9	" 8	6 11	6 25	5 6	c	b s	5 6	5 6	1 1/2
Holland	p	10	" 9	6 8	6 29	8 9	o i	d s	4 5	3 4	1/2
Hood River	b	4 5	" 11	6 10	6 30	5 6	r o	b s	5 6	7 8	1/2
Homestead	b	6 7	" 11	6 10	7 5	6	r c o	d c	8 9	7	1/2
Howell No. 2	b	4 5	" 8	6 11	6 30	5	o i	d c	5 6	6 7	1/2 to 1/4
Hyslop	b	6 7	" 8	6 4	6 27	8	c o b	d c	7 8	5 6	1/2
Ideal	b	4 5	" 9	6 10	6 29	5 6	c	d c	6 7	8 9	1/2
Irene	p	5	" 9	6 10	7 1	10	c c o	b c	7 8	9 10	1/2
Isabel	b	8 9	" 12	6 9	6 30	10	c o c i	d c	6 7	9	1/2
Kansas	b	7	" 8	6 9	7 2	10	r c	d s	7 8	7	1 1/2
Kennedy (Anna)	p	6 7	" 13	6 9	6 3	4 5	o	b s	6 7	5	1 1/2
Klickita	p	9 10	" 8	6 11	7 2	6	r c o	d s b	7 7	4 5	1 1/2
King Worthy	b	7	" 9	6 11	7 2	8	r c	b s	3 4	4 5	1/2 to 1/4
Knight	b	7 8	" 11	6 9	6 30	10	c o c i	b s	4 5	4 5	1/2
Kossuth	b	8	" 4	6 9	6 25	9	r c o	b c	5 6	5 6	1/2
Kyle	b	6 7	" 9	6 12	6 30	6	r o	b c	5 6	4 5	1/2
La Crose	b	9 10	" 13	6 11	7 2	5	c c o	b s	5 6	4 5	1/2
Lanahan	b	9	" 16	6 12	6 29	1 2	l c	s	5 6	8 9	1 1/2
Laxton No. 1	b	5	" 9	6 11	6 25	2 3	c i c o	d c	8 9	9 10	1/2
Leader	b	5	" 7	6 9	6 29	8 9	r c	d c	8 9	9	1/2
Lehigh	p	10	" 9	6 9	6 30	10	r c i	d c	6 7	8	1/2
Leroy	p	7 9	" 9	6 11	6 29	10	r c i	b c	8 9	7	1/2
Lincoln	p	9 10	" 7	6 8	6 30	10	c i	d c	5 6	5	1 1/2
Little 42	n p	10	" 8	6 9	7 2	10	c i c o	e l s	5 6	2 3	1/2
Longfield	p	8 9	" 7	6 11	6 30	10	c	b c	6 7	7	1/2
Lovett	b	9 10	" 9	6 9	6 30	8 9	c o c i	b c	7 8	7 8	1/2
Mamie Warfield (606)	p	3 4	" 12	6 10	6 19	6	r c o	b s	3 4	3 4	1 1/2
Manwell	b	4 5	" 11	6 8	6 30	8	r c i	d c	4 5	5 6	1/2
Margaret	b	5	" 13	6 10	6 30	4 5	c c o	d c	7 8	7 8	1/2
Marshall	b	7 8	" 5	6 9	6 30	5 6	c o c i	b c	7 8	7 8	1/2
Mary	p	5 6	" 9	6 11	6 30	5	r c i	d c	5 6	6 7	1/2
Maxwell	p	9 10	" 9	6 12	6 30	4 5	c c o	d s	5 6	6	1/2
Maybrott	b	8 4	" 4	6 12	6 27	2 3	r c i	d c	6 7	9 19	1 1/2
Mayflower	b	9 10	" 8	6 8	6 23	7 8	l c	s	6 7	6 7	1/2
McKinley	b	7 8	" 12	6 13	6 30	4 5	c	d c	6 7	5 6	1/2 to 1/4
Meeks	b	4 5	" 7	6 8	6 20	4	r c	d c	5 6	8	1 1/2
Minneapolis	b	8	" 16	6 12	6 30	4 5	o r c	l c	4 5	6 7	1/2
Murray	b	6 7	" 13	6 10	6 25	3	c r	b c	5 6	9 10	1/2
Noble	p	---	" 11	5 16	6 29	---	---	b c	7 8	8 9	---
No Name	b	5	" 13	6 11	6 30	---	c o c i	d c	3 4	4 5	1/2 to 1/4
No. 7	b	5	" 8	6 13	6 23	3 4	c o r i	d s	3 4	5 6	1/2
No. 8	b	3 4	" 11	6 16	6 23	1	c o	l c	4 5	5 6	1/2
No. 40	b	10	" 11	6 11	7 2	9 10	r c l o o	l c	6 7	4 5	1/2
No. 1000	p	8 9	" 13	6 13	6 30	5	r	b c	5 6	6 7	1/2 to 1/4
Ocean City	p	2 3	" 15	6 14	6 30	2 3	r c c o	b c	6 7	5 6	1/2
Odessa	b	7	" 13	6 13	7 2	5	r c i	b s	5 6	8	1/2
Omega	p	6	" 13	6 11	6 30	6	r c	b s	4 5	4 5	1/2 to 1/4
Ona	p	8 9	" 4	6 8	6 25	5 6	r c o	d s	6 7	6 7	1/2

TABULATION OF STRAWBERRIES—Concluded.

Names.	Sex.	Vigor (1-10).	Date bloom.	Date first pick- ing.	Date last pick- ing.	Productiveness, scale (1-10).	Form.	Color.	Quality (1-10).	Texture (1-10).	Weight (oz.).
Orange Co.....	p	8	May 9	6 9	6 30	10	ro	lc	5 6	6	3/4
Oregon.....	b	2 3	" 9	6 14	6 30	3	cco i	bc	6 7	8 9	3/4
Oricle.....	p	1	" 13	6 14	6 23	1	c	dc	6 7	9 10	3/4
Orono.....	p	7 8	" 9	6 14	6 30	3 4	cloo	dc	7 8	6 7	3/4
Oscar.....	b	1	" 19	6 16	6 20	1					
Ostego.....	p	2 3	" 14	6 14	6 23	2 3	r	s	4 5	6 7	1-5
Paris King.....	b	7 8	" 8	6 8	6 30	9	obcco	bs	5 6	8 9	3/4
Parker Earle.....	b	4	" 17	6 14	6 30	7 8	reco	ds	4 5	6 7	3/4
Patrick.....	b	7	" 9	6 8	6 29	9	cco	bc	6 7	6 7	3/4
Peabody.....	b	8	" 9	6 11	6 30	8	cco i	ls	3 4	3 4	3/4
Perfection.....	p	3 4	" 13	6 14	6 30	2	creco	bc	4 5	8 9	3/4
Pet.....	b	5	" 13	6 16	6 20	3 4	ri	bc	6 7	5 6	3/4
Phippen.....	b	10	" 9	6 8	6 29	5	cloo	dc b	6 7	9	3/4
Plow City.....	b	4	" 14	6 16	6 30	5	ci	lc	3 4	8	3/4
Premium.....	p	6	" 17	6 16	6 30	4 5	oi	lc	4 5	5 6	3/4
Pride of Cumberland.....	b	3 4	" 11	6 9	6 25	4 5	re	lc	4 5	5 6	3/4 to 3/4
Princeton.....	b	8 9	" 3	6 13	7 2	9 10	c	bs	3 4	4	3/4
Richmond.....	b	2	" 9	6 11	6 30	5	cco i	dc	8 9	10	3/4
Ridgeway.....	b	5 6	" 14	6 13	6 30	4 5	r	dc	6 7	6 7	3/4 to 3/4
Riehl (Ruby).....	b	7	" 4	6 11	6 30	7	rci	bc	7 8	8 9	3/4 to 3/4
Rio.....	b	7 8	Apr. 30	6 3	6 25	6 7	ori	leb	7 8	9	3/4
Rob Buek.....	b	2	Ma 9	6 11	6 20	2	c	dc	6 7	8 9	3/4
Sandoval.....	b	3 4	" 9	6 11	6 30	4	co	dc	8 9	8	3/4
Satisfaction.....	b	7	" 9	6 11	7 2	4	ci	dc	6 7	3 4	3/4
Saunders.....	b	7	" 14	6 11	7 5	8	relp	dc	9 10	10	3/4 to 3/4
Shawnee.....	b	5 6	" 9	6 10	6 30	10	cco i	dc	4 5	5 6	3/4
Sherman.....	b	3 4	" 11	6 14	6 29	10	ro	bs	6 7	5	3/4
Shyster.....	p	7	" 7	6 9	6 30	9 10	orc	lc	3 4	3 4	3/4
Smalley.....	p	3 4	" 8	6 14	6 30	5	ci	dc	4 5	7	3/4
Smeltzer.....	b	7 8	" 4	6 8	6 22	6	roo	bc	7 8	6 7	1-5
Smith.....	b	8 9	" 1	6 6	6 22	9 10	rei	ds	4 5	4 5	1-5
Snowball.....	b	8 9	" 8	6 9	6 28	3	cr	ds	5 6	8	3/4
Sparta.....	b	5 6	" 4	6 8	6 22	4 5					3/4
Stahelin.....	p	7	" 9	6 13	7 2	9 10	reio	bc	5 6	7 8	3/4
Star.....	b	7	" 14	6 11	6 29	10	reico	dc	3 4	3 4	2-5
Splendid.....	b	7 8	" 9	6 9	6 30	8 9	reo	c	4 5	7 8	3/4
Springdale.....	b	7	" 13	6 14	6 29	5 6	rei	c	6 7	4 5	3/4
Staples.....	b	7	" 9	6 8	6 25	5 6	ci	dc	7 8	9	3/4
Stewart.....	b	7	" 4	6 8	6 20	2 3	re	ds	6 7	9	1-5
Stone (Ey).....	p	4 5	" 11	6 9	6 25	3 4	ci	ds	3 4	6 7	3/4
Sunnyside.....	p	7	" 14	6 13	6 30	6	roc	s	3 4	3 4	3/4
Sunrise.....	p	2	" 13	6 9	6 30	5 6	recoi	dbs	5 6	5 6	3/4
Surprise.....	p	2	" 8	6 14	6 24	2 3	cob	dc	6 7	5 6	3/4
Tennessee.....	b	10	" 8	6 8	6 30	9 10	roco	bc	6 7	8	3/4 to 3/4
Tennyson.....	b	6	" 11	6 12	6 30	4 5	rre	ds	4 5	4 5	3/4
Thompson 40.....	p	9 10	" 13	6 14	6 30	8	re	bs	3 4	5 6	3/4
Thompson 66.....	p	10	" 9	6 10	7 5	5 6	cco	dc	4 5	8 9	3/4
Timbrel.....	p	7	" 14	6 14	7 2	5 6	reico	dbs	7 8	5 6	3/4
Tonga.....	p	5	" 9	6 16	6 7	6 7	recoi	bc	4 5	4 5	3/4
Topeka.....	b	6 7	" 11	6 14	6 28	3 4	lcco	ds	3 4	8 9	3/4
Tubbs.....	b	1 2	" 14	6 14	6 28	1 2	oro	bc	5 6	7 8	3/4
Warfield.....	p	3 4	" 9	6 13	6 20	2	coo	dbs	6 7	6 7	1-5
Welton.....	b	3	" 11	6 14	6 28	3 4	re	leb	3 4	7 8	3/4
Weston.....	p	7 8	" 13	6 14	6 23						
Williams.....	b	7 8	" 11	6 8	6 28	5 6	ci	dc	9 10	8 9	3/4 to 3/4
Will Warfield (147).....	b	1 2	" 13	6 13	6 20	3/4	c	ls	3 4	4 5	1-6
Wood (Beder).....	b	6 7	" 9	6 11	6 30	9 10	rre	ls	3 4	4 5	3/4
Woolverton.....	b	8 9	" 13	6 11	7 2	8 9	lcco	c	8 9	9 10	3/4
World Champion.....	p	4 5	" 13	6 11	6 23	4 5	cr	s	4 5	6 7	1-7
Wyatt.....	b	6	" 13	6 11	6 31	3 4	rre	lc	4 5	4 5	3/4

Among the varieties tested were several kinds from a western originator, that had been introduced by crossing a number of well-known sorts, and the names under which they were received were formed by uniting the names of the parents. Thus where the parents were the Hattie and the Warfield, the name given the new variety was Hattie-Warfield, and so on. Most of the plants were in poor condition when they were received and a very imperfect stand of plants was secured, while those that did start made a weak growth. Nearly all of the other varieties were tested at the college, and the description of the varieties has been given in Bulletin 163.

Among the more productive varieties were the Acem (6), Arkansas Traveler (3-4), Aroma (4-5), Arrow (6-7), Auburn (7-8), Avery (4-5), Beauty (5-6), Bickle (5-6), Bouncer (7-8), Bubach No. 5 (5-6), Crescent (5-6), Daisy (7-8), Fountain (7-8), Giant (3-4), Greenville (5-6), Haverland (8-9), Irene (7-8), Isabel (6-7), Knight (4-5), Lehigh (6-7), Leroy (8-9), Lincoln (5-6), Little No. 42 (5-6), Longfield (6-7), Orange County (5-6), Princeton (3-4), Shawnee (4-5), Sherman (6-7), Shyster (3-4), Smith (4-5), Stahelin (5-6), Star (3-4), Tennessee (6-7), Wood (Beder) (3-4), Woolverton (8-9).

All of the above varieties have a rating for productiveness of at least 9, and their quality is indicated by the numbers given in parentheses. 10 meaning superior quality.

Of the kinds that fruited first in 1898 few of the following varieties have heretofore been described in the bulletins, either of the station or sub-station:

**Carnot.**—Bisexual plant, somewhat lacking in vigor. Fruits large, long, conical, somewhat irregular and compressed; color deep crimson. The flesh is dark crimson; seeds medium, sunken; texture moderately firm; core open; quality fair. Too poor in quality for a variety for home use, and its low vigor and productiveness prevent its being desirable as a market variety.

**Delia.**—Pistillate. A strong-growing productive variety, with large, roundish, conical fruits; color deep scarlet. Flesh bright scarlet; seeds small, sunken, reddish at maturity; texture moderately firm, and the flesh is of a sprightly, rich flavor. Season medium. A promising variety for either home use or market.

**Faux.**—Bisexual. Moderately vigorous, but lacking in productiveness. The berries are of large size, conical and slightly compressed; color dark crimson; flesh bright scarlet; seeds medium, slightly sunken; texture firm; core slightly open; flavor pleasant, rather rich. Quality good.

**Kennedy (Anna).**—Plant imperfect, fairly vigorous. Fruits medium size, oblate; color bright scarlet; seeds prominent, purple at maturity; texture quite firm; flavor sprightly, pleasant; quality fair. Somewhat lacking in productiveness. Season June 9.

**King Worthy.**—Plants fairly vigorous, perfect. Fruit large, roundish conical, bright scarlet. Flesh light; seeds medium, purple at maturity; texture not very firm; core spongy; flavor fair; quality medium; season June 11. The plants are only moderately productive, and the quality and firmness are so low that the berries are of little value for any purpose.

**Manwell.**—Plants moderately vigorous, perfect. Fruit rather large, roundish conical, irregular; color dark crimson; flesh bright scarlet; seeds very small, sunken, reddish purple; texture very firm; quality fair to good; moderately productive; season June 8.

**Margaret.**—Plants moderately vigorous, perfect. Fruit rather large, conical, compressed; color dark crimson; flesh dark scarlet; seeds numerous, purplish; texture quite firm with an open core in some specimens; somewhat lacking in productiveness; season June 10. A handsome variety, of much merit for market or home use if it proves sufficiently productive.

**McKinley.**—Plants quite vigorous, perfect. Fruit rather large, varying from conical to roundish conical; color quite dark crimson; flesh scarlet; seed prominent, reddish at maturity; texture moderately firm; flavor pleasant, quite rich, quality good; season June 13. A fairly productive variety, with some merit as a general purpose sort.

**Minneola.**—Plants perfect flowered. Fruit medium size, oblate to roundish conical; color rather light, but quite bright crimson; flesh light scarlet; seeds prominent, red at maturity; texture rather firm; flavor mild; quality fair to good. Somewhat lacking in productiveness.

**No Name.**—Plants moderately vigorous, perfect. Fruit rather large, conical, compressed, irregular; color dark crimson; flesh scarlet; seeds prominent, purple at maturity; texture quite soft; core open; flavor mild; quality fair. Although moderately productive, the lack of firmness and poor quality of fruit render it of but slight value.

**Ocean City.**—Plants perfect flowered. Fruit medium size, roundish conical, compressed; color bright crimson, rather dark and of a handsome appearance; flesh scarlet; seeds prominent, greenish when matured; texture moderately firm; core open; flavor sprightly; quality good. If sufficiently productive, it may prove a valuable variety for market purposes.

**Patrick.**—Plants quite strong, perfect. Fruit medium size, conical, compressed; color bright and rather light crimson; flesh scarlet, seeds prominent; color greenish at maturity; texture quite firm; core slightly open; quality fair to good. Quite productive. A promising market sort; season June 8.

**Perfection.**—Plants perfect flowered. Fruit medium size, conical to roundish conical, compressed; color very bright crimson; flesh scarlet, seeds small, slightly sunken, red at maturity; texture rather firm; flavor pleasant; quality good; season June 14. A very handsome berry and if it proves sufficiently productive, it promises to be valuable either for home or market.

**Premium.**—Plants quite strong, imperfect. Fruit medium size, oblate, generally irregular; color dark scarlet; flesh light scarlet; seeds prominent, purple at maturity; texture moderately firm; core slightly open; flavor sprightly; quality fairly good; season June 16. Productiveness fair to good.

**Pride of Cumberland.**—Plants perfect flowered. Fruit rather large, roundish conical; color bright, light crimson; flesh scarlet, seeds numerous, prominent, brownish; texture quite firm; core open; flavor sprightly; quality good; season June 9. Fairly productive. Worthy of trial as an early market sort.

**Peabody.**—Plants fairly vigorous, perfect. Fruit medium size, conical, compressed, irregular; color rather light scarlet; flesh light colored, seeds sunken, greenish; texture rather soft; flavor slightly vinous; quality fair; season June 11; quite productive. Promising for near-by markets.

**Ridgeway.**—Plants fairly vigorous, perfect. Fruit large, roundish; color dark crimson; flesh bright scarlet; seeds prominent, reddish brown; texture quite firm; core open; flavor quite pleasant; quality good; fairly productive; season June 13. The plants thus far have been only moderately productive, but if this quality is developed it bids fair to be a valuable market variety.

**Satisfaction.**—Plants quite strong. Fruit medium size, conical, somewhat irregular; color light crimson; flesh bright scarlet; seeds numerous, sunken; texture rather soft; quality fair; season June 11. Only moderately productive.

**Sparta.**—Plants fairly vigorous, perfect. Fruit medium size, roundish, irregular; color bright, dark crimson; flesh quite pale; seeds numerous, small; texture firm; flavor sprightly; quality fair; rather under the average in productiveness.

**Star.**—Plants quite strong, perfect. Fruit rather large, roundish conical, irregular, compressed; color dark crimson; flesh light scarlet; seeds many, slightly sunken, color purple; texture moderately firm; flavor vinous; quality fair; season June 11. The plants were among the most productive and promise well as a variety for local markets.

**Stone.**—Plants fairly vigorous, imperfect. Fruit medium size, conical, irregular; color bright, dark scarlet; flesh light scarlet; seeds sunken, greenish white; texture moderately firm; core open; quality fair; season June 9. Productiveness fair.

**Sunrise.**—Plants quite strong, imperfect. Fruit medium to large, roundish, compressed, irregular and sometimes oblate; color dark, bright scarlet; flesh light scarlet; seeds medium size; slightly sunken, reddish; texture quite firm; core open; flavor sprightly, pleasant; quality fair to good; season June 9. The plants are quite productive and it seems to be a promising sort either for home use or market.

**Tennyson.**—Plants quite strong, perfect. Fruit medium to large, roundish to roundish conical; color dark scarlet; flesh light; seeds medium size, purple; texture rather soft; core open; flavor not rich, but rather pleasant; quality fair to good; season June 12. Plants moderately productive. Valuable for local markets, if at all.

## RASPBERRIES.

The trial plantation of raspberries was made in 1896, and is now in excellent bearing condition. After the plants had received their spring pruning, they were sprayed with a solution of copper sulphate, using one pound to twenty-five gallons of water, and after the new growth had started, an application of Bordeaux mixture of the usual strength was made for the prevention of anthracnose, and this proved sufficient to keep the new canes practically free from attack. No other disease nor insect appeared. After the plants had fruited, the old canes were cut out and oats were sown on the 23rd of August, as a winter mulch and to aid in ripening off the growth by the removal of surplus water, from the soil. The season was quite favorable to the raspberry crop, and an excellent yield was secured from nearly every variety. Although most of the kinds have received attention in previous reports, the following descriptions are given under their respective classes:

AMERICAN RED RASPBERRIES, INCLUDING SUPPOSED HYBRIDS WITH THE  
EUROPEAN RASPBERRY.

Among the more productive of the red varieties were Brandywine, Church, Cuthbert, Early King, Golden Queen, Hansell, Kenyon, Loudon, Marlboro, Miller, Reeder, Thwack and Turner, several of which are well-known commercial varieties. Among the older kinds, Cuthbert is among those best known, and it generally proves satisfactory. Although not especially productive, Hansell ripens about one week earlier than most of the other sorts, and being early and hardy, is a valuable sort for home use and in a small way, perhaps, for market.

King, for which high claims are made, on account of its supposed earliness, has not shown that characteristic to a marked degree, ripening four or five days later than Hansell and but two or three days before Cuthbert. The plants are quite hardy and of healthy though rather slender growth, owing to the tendency to sucker freely. Where the canes are properly thinned out, the fruits reach a fair size, comparing well with Hansell and the other early kinds.

## TABULATION OF RASPBERRIES, 1898.

ABBREVIATIONS—c, conical; o, oblate; ob, oblong; r, roundish; b, blackish; p, pubescent; pa, purplish; r, red; y, yellow.

Number.	Name.	Species.	Bloom.	First picking.	Last picking.	Product—(1-10).	Form.	Color.	Average weight. (Ounces.)	Quality—(1-10)
1	Brandywine	Strigosus	63	7 8		10	r o	o	2-38	7 8
2	Cardinal	Neglectus	62	7 5	8 3	10	r	o	2-38	6 7
3	Carman	Occidentalis	5 28	7 2	7 22	10	r	o	2-50	5 8
4	Caroline	Neglectus	63	7 5	7 28	10	r	o	2-38	2 8
5	Centennial	Occidentalis	62	7 5	7 27	8 9	r	o	2-45	6 7
6	Champlain	Strigosus								
7	Church	Strigosus	63	7 6	8 5	9 10	r	r	2-32	7 8
8	Clark	Occidentalis	5 28	7 5	7 22	8 9	r	o	2-34	5 6
9	Columbian	Neglectus	66	7 9	7 30	8 9	r o	o	2-32	3 4
10	Conrath	Occidentalis	63	7 5	7 30	8 9	r	o	2-46	5 6
11	Cromwell	Occidentalis	5 30	7 2	7 27	10	r	o	2-54	4 5
12	Cuthbert	Strigosus	61	7 6	7 27	9 10	r	o	2-30	5 6
13	Diamond	Occidentalis	63	7 9	8 1	8 9	r	o	2-40	7 8
14	Doelittle	Occidentalis	61	7 5	8 5	10	r	o	2-54	5 6
15	Barhart	Occidentalis	61	7 2	8 5	8 9	r	o	2-45	5 6
16	Early King	Strigosus	61	7 8	7 25	10	r o	ds	2-32	7 8
17	Emmet	Neglectus	66	7 8	8 1	8 9	r	o	2-24	3 4
18	Eureka	Occidentalis	62	7 5	7 23	10	r	o	2-34	5 6
19	Farnsworth	Occidentalis	61	7 6	7 23	10	r	o	2-48	4 5
20	Gladstone	Neglectus	61	7 5	7 22	7 8	r	o	2-40	4 5
21	Golden Queen	Strigosus	64	7 6	8 1	7 8	r	o	2-30	7 8
22	Green	Occidentalis	5 31	7 5	8 3	9 10	r	o	2-50	6 7
23	Gregg	Occidentalis	64	7 11	8 5	8 9	r	o	2-46	4 9
24	Hansell	Strigosus	5 30	6 28	7 27	10	r	o	2-42	5 6
25	Herstine	Idaeus hyb ?	63	7 6		7 8	r o	r	2-28	9 10
26	Hilborn	Occidentalis	63	7 8	7 29	9 10	r o	o	2-64	5 6
27	Idaho	Occidentalis	64	7 9	8 5	8 9	r o	o	2-46	5 6
28	Indiana	Occidentalis	62	7 5	7 22	7 8	r o	o	2-42	5 6
29	Jap. Wineberry	Phenoclasus	9 20	7 29	8 26	10	r	o	2-72	10
30	Johnston	Occidentalis	64	7 8	8 5	9 10	r	o	2-48	5
31	Kansas	Occidentalis	63	7 6	7 28	9 10	r o	o	2-46	5 6
32	Kenyon	Strigosus	66	7 9	8 5	5 6	r	o	2-29	4 5
33	London	Strigosus	66	7 8	8 5	10	r	o	2-30	4 5
34	Lovett	Occidentalis	61	7 5	7 27	8 9	r	o	2-72	10
35	Marlboro	Strig's Idaeus	61	7 2	8 3	10	r	o	2-32	5 6
36	Miller	Strigosus	62	7 2	8 28	10	r	o	2-32	7 8
37	Mills (15)	Occidentalis	63	7 8	7 30	8 9	r o	o	2-36	6 7
38	Muskingum	Neglectus	64	7 6		8 9	r o	o	2-34	5 6
39	Nemaha	Occidentalis	64	7 8	7 27	8 4	r o	o	2-52	5 6
40	Ohio	Occidentalis	5 31	7 8	7 27	10	r o	o	2-48	6 7
41	Older	Occidentalis	61	7 5	8 1	10	r o	o	2-46	5 6
42	Otis	Neglectus		7 11	8 1	8 9	r	o	2-38	4 5
43	Palmer	Occidentalis	5 29	6 30		9 10	r	o	2-46	7 8
44	Phoenix	Occidentalis	61	7 2	8 1	5 6	r	o	2-44	6 7
45	Progress	Occidentalis	63	7 5	7 30	7 8	r	o	2-45	5 6
46	Redfield	Neglectus	69	7 9	7 30	8 9	r	o	2-40	3 4
47	Reeder	Strigosus	63	7 5	8 3	10	r o	o	2-34	8 9
48	Reliance	Strigosus	63	7 6	8 1	8 9	r	o	2-34	4 5
49	Sarah	Strigosus	6 12	7 27	8 20	1				
50	Shaffer	Neglectus	66	7 9	8 5	8 9	r	o	2-38	5 6
51	Smith Giant	Occidentalis	66	8 1		.1	r	o	2-48	5 6
52	Smith Prolific	Occidentalis	63	7 6	7 30	9 10	r	o	2-55	9 10
53	Sothehan	Occidentalis	5 31	7 2	7 3	8 9	r o	o	2-70	5 6
54	Strawberry-raspberry	Rosaeifolius	69	7 15		5 6	ro	o	2-6	2 3
55	Superlative	Idaeus	61	7 5	7 25	8 9	l c	o	2-20	4 5
56	Thompson	Strigosus	63	7 2	7 22	8 9	r	o	2-40	4 5
57	Thwack	Strigosus	64	7 5	8 24	10	r	o	2-40	5 6
58	Turner	Strigosus	64	7 5	8 1	10	r	o	2-44	8 9
59	Tyler	Occidentalis	61	7 2	7 30	10	i	o	2-48	5 6
60	Winona	Occidentalis	5 31	7 5	7 20	7 8	r	o	2-98	5 6



Kenyon and Loudon have been fruited for three years, and although they show slight differences in productiveness from year to year, owing to the different ways under which they have been grown, in other respects they are practically identical, the size, shape, color and flavor of the fruit being the same and the first and last fruits were gathered upon the same days. The vines seem quite hardy and productive, and as the fruit is of large size, slightly exceeding that of Cuthbert, quite firm and of an attractive color, they seem to be very promising as market sorts, although in quality they are not equal to Cuthbert. These varieties, as well as Hansell, King, Miller and others, seldom branch, and with them the practice so commonly recommended a few years since to pinch back the tips of the new canes when they reach a height of two feet or thereabouts, is not advisable. When allowed to grow naturally, the canes form strong buds, from which the fruiting branches will be developed the following season, while if the ends are pinched, the buds will develop the first year into slender shoots, upon which the fruit buds will be weak. As a result of this the fruit will generally be small, and may often fail to develop, and there will be an increased tendency toward winter killing. Hence, for the non-branching varieties, the practice of pinching back the new growths in the spring is not to be recommended.

Miller is of less vigorous growth than Cuthbert, but the plants seem hardy and productive and the fruit is large and of high quality, being sweet and pleasant in flavor. The color is attractive, and it seems to be a promising variety for home use and for markets that are easily reached, but the fruit is rather tender for distant shipments.

Thompson has again failed to show valuable characteristics, as the fruit is quite small and of inferior quality; and it is a medium season variety, although high claims were made for it as an early sort.

#### BLACK RASPBERRIES.

The old varieties like Carman, Clark, Cromwell, Doolittle, Earhart, Hilborn, Lovett and Souhegan, although fairly hardy and productive, produce fruit of a comparatively small size, and unless the plantations are frequently sprayed are quite subject to anthracnose, so that there seems to be little need of retaining them in the fruit lists, as there are many well-known kinds that equal them in other respects, and produce fruit of a good size.

Palmer this year gave ripe fruits two or three days before any of the other kinds, and as it has been thoroughly tested, in all parts of the State, and found hardy and productive, with fruit of a good size, it seems well worthy of its place as an early variety for market.

Clark fruited for the first time in 1898. Although the plants are rather small, they were fairly productive. The berries were somewhat injured by the drought, but were of good size compared with those of surrounding varieties. The fruit was firm, somewhat lacking in juice, but of a sprightly and rich vinous flavor. Under more favorable conditions it would undoubtedly have made a much better showing.

Conrath follows within a few days and seems equal to the Palmer in all respects, except in quality, and has the advantage of being larger.

Diamond is a new variety with a strong growing, healthy plant, and late in its seasons of ripening. The fruit is very large, moderately firm

and of high flavor. From its behavior the last two years, it seems to be a promising variety for either home use or market.

Eureka has again made an excellent showing, as a large, medium late variety. The plants are of strong growth and quite productive. Although the fruits are not of the highest quality, it has much merit as a market sort.

Farnsworth is a vigorous and healthy plant, and has for two years been one of the most productive varieties. It is above medium in size, and of good although not high quality. The clusters are large, upon rather long, stout fruit-stalks, and the berries are quite firm and moderately juicy. Although not thoroughly tested in other sections, it seems to be a valuable variety for market purposes, or for home use.

Green also has some valuable points, although rather less vigorous than Farnsworth. It has been quite productive, and the fruit, besides being of good quality, is firm enough for shipment. The clusters are medium size, upon short and rather slender fruit stalks. The principal objection to the variety noted this year is that the fruit averages rather small in size, although it was nearly as large as Gregg, which for some reason was considerably under size and was hardly up to its usual standard in productiveness.

Idaho has a firm berry that should make it valuable either for market purposes or for evaporating. The plants are vigorous and quite productive and the fruit which is much above the average in size, is borne in large, compact clusters, upon short and rather stout fruit stalks. Its color is nearly black, but it is covered with a dense pubescence. The flavor is sprightly and slightly vinous.

Indiana was less promising than in other years, the growth of the canes the previous year having been rather small. The plants, however, were quite productive, and the fruit was of large size in quite large clusters, upon moderately long stalks. The fruit was firm and somewhat lacking in juice, but of a pleasant and rich flavor, so that it seems valuable for market or dessert purposes; color, black, with a plentiful pubescence.

Johnston made a satisfactory growth and was quite productive, but the fruit was very small and of poor quality.

Kansas has a vigorous and healthy plant and was among the more productive kinds, although the fruit the past season was unusually small. The clusters are quite large and compact, and the fruit is borne upon short, moderately stout stalks. The berries are of a mild flavor and being quite firm and only moderately juicy, it is a valuable sort for market purposes.

Mills (No. 15) was rather less productive than in 1897, but gave a large amount of fine berries. The clusters were large and compact, upon moderately long and stout fruit stalks. The berries were firm, and of a rich, pleasant flavor; color, black, with a plentiful pubescence. Promising either for commercial plantations or for the home garden.

Phoenix, after two years trial, has failed to show its value. The plants are somewhat lacking in vigor, and are far below other varieties in productiveness. The clusters are medium in size, with berries upon long, slender pedicels; color, black, moderately juicy and of a mild, pleasant flavor.

Progress is moderately vigorous and fairly productive, although not equal to its record of 1897. The berries are of good size and are borne

tion should be discouraged. The fruits are quite large and of a strikingly bright scarlet color. The berries consist of small, rather dry pips and are developed upon a very large receptacle, so that they have something the appearance of a large, flattened thimble. The flesh is rather dry and has a peculiar flavor. It is of no value, whatever.

### BLACKBERRIES.

The blackberry plantation received the same treatment as the raspberries, and was quite free from both insects and diseases. Early in August, the leaf miner appeared upon the foliage, and the infested leaves were gathered and burned. The season being very favorable, a large crop of fruit was secured. None of the varieties were injured by the winter. Among the more productive of the new sorts were Lincoln, Minnewaska, Nevada, Ohmer, Reyner, Sanford; and nearly all of the old standard kinds, planted for comparison, gave good crops, none of them being marked less than eight, upon a scale of eight to ten for productiveness.

Childs *Tree* was only moderately vigorous, or productive, but the fruit was of good size, roundish-oval and borne in clusters of medium size. The berries were moderately firm, quite juicy and of a mild and pleasant flavor. It does not show any tree-like characteristics.

Early King ripened soon after Early Harvest and seems to be larger and of better flavor than that variety. The berries are oblong in form and consist of large, moderately compact fruits. They are quite juicy and have a pleasant, vinous flavor. One of the most promising of the early varieties.

Early Mammoth has for two years shown itself very vigorous and productive. The fruit is of a large size, irregular oblong in form, and is borne in large compact clusters. The berries are moderately juicy and of a mild flavor. Seems to be a promising sort for either home use or market.

Eldorado is a highly praised variety of medium size, which has shown itself to be of more than average vigor and productiveness, but it hardly warrants the praise it has received. Although the plants are somewhat different in growth from those of Snyder, there is a general resemblance in the fruit to that variety. It seems to be quite hardy, and it is possible that further trial may develop its good points.

## TABULATION OF BLACKBERRIES, 1898.

ABBREVIATIONS—i, irregular; o, oblong; ov, oval; r, roundish; b, black.

Number.	Name.	Planted.	Bloom.	First picking.	Last picking.	Product—(1-10).	Form.	Color.	Weight in oz.	Quality—(1-10).
1	Agawam.....	1888	6 4	7 23	8 24	8 9	ro i	b	2-14	7 8
2	Ancient Briton.....	1888	6 5	7 27	8 24	8 9	ro i	b	2-16	8 4
3	Childs (Tree).....	1888	6 13	7 25	8 24	8 9	ro	b	2-16	4 5
4	Early Harvest.....	1888	6 10	7 17	8 1	8 9	o	b	2-20	5 6
5	Early King.....	1890	6 4	7 19	8 1	8 9	i o	b	2-22	7 8
6	Early Mammoth.....	1888	6 8	7 23	8 20	10	i o	b	2-15	6 7
7	Eldorado.....	1894	6 4	7 23	8 20	7 8	o	b	2-18	6 7
8	Erie.....	1888	6 6	7 26	8 21	8 9	o	b	2-12	4 5
9	Fruitland.....	1888	6 10	8 1	8 15	7 8	ro	b	2-22	4 5
10	Kittatinny.....	1888	6 6	7 25	8 27	9 10	o i	b	2-14	7 8
11	Knox.....	1888	6 4	7 28	8 31	9 10	o	b	2-16	6 7
12	Lawton.....	1888	6 4	7 23	8 15	10	o	b	2-16	6 7
13	Lincoln.....	1888	6 3	7 25	8 27	10	r	b	2-25	8 9
14	Lovett (Best).....	1896	6 6	7 29	8 24	7 8	r	b	2-25	5 6
15	Maxwell.....	1894	6 6	7 30	8 23	8 9	ro	b	2-20	5 6
16	Minnewaska.....	1888	6 6	7 26	8 31	10	ro	b	2-14	5 6
17	Nevada.....	1888	6 5	7 25	8 31	10	o	b	2-14	5 6
18	Ohmer.....	1888	6 3	7 24	8 31	10	r	b	2-16	6 7
19	Oregon (Everbearing).....	1888	6 11	8 11	8 30	8 9	o	b	2-40	5 6
20	Piase.....	1896	6 3	7 25	8 20	5	i o	b	2-20	5 6
21	Reynier.....	1890	6 8	7 28	8 20	9 10	o	b	2-24	5 6
22	Sanford.....	1894	6 4	7 16	8 17	9 10	o	b	2-24	4 5
23	Snyder.....	1888	6 4	7 23	8 24	8 9	o	b	2-22	10
24	Taylor.....	1888	6 3	7 26	8 23	10	or	b	2-16	9 10
25	Thompson.....	1888	6 4	7 18	8 24	9 10	o i	b	2-12	8 4
26	Triumph (Western).....	1888	6 4	7 28	8 21	10	ro	b	2-30	4 5
27	Wallace.....	1888	6 5	7 12	8 31	10	o	b	2-16	6 7
28	Wilson.....	1888	6 4	7 20	8 24	9 10	i o	b	2-10	8 4
29	Wilson, Jr.....	1888	6 3	7 20	8 24	9 10	i o	b	2-10	8 4

Lincoln has been quite vigorous and productive. The fruits are medium size moderately firm and with a large amount of juice. The flavor is rich and pleasant, and if the plants prove hardy in all sections, it promises to become a standard variety for home use or market purposes.

Lovett *Best*, although recently planted, has made a fair growth and gave a good amount of fruit. The fruit is roundish, inclining to oval, and is of a compact form, with a moderate amount of juice. The flavor is pleasant and mild. It has not been grown sufficiently long to enable it to make the best possible showing.

Maxwell also made but a moderate growth, but it slightly exceeded the productiveness of Lovett. The fruit is somewhat large and of a mild flavor. Its loose texture would seem to make it of value only for near-by markets, or for home gardens.

Minnewaska was one of the most vigorous and productive varieties grown. The fruit was of large size, roundish oblong and was borne on rather stout, smooth pedicels in clusters of medium size that were moderately compact. The berries were fairly firm and with a plentiful amount of juice; flavor mild. A promising variety for general planting.

Ohmer, although among the last of the kinds to be planted, has shown excellent vigor and productiveness. The fruits are roundish-oval and are

borne in quite large, compact clusters, on smooth pedicels, of medium size. The fruits themselves are fairly firm, but with a plentiful amount of juice. The flavor is pleasant but mild. The large size of the fruits, combined with the vigor and productiveness of the plants, makes it a promising kind for market, and one that is also valuable for home use.

Oregon *Everbearing* has made a vigorous growth and, the past year, has been moderately productive. It is a trailing variety, with cut-leaved foliage. The fruits are quite small, oblong, and quite compact. They are moderately juicy, and with a pleasant flavor. It seems to have no special value.

Piasa is of rather weak growth, and lacking in productiveness. The fruit is rather small, of an irregular oblong form, borne in small compact clusters. The berries are compact, somewhat lacking in juice and of a mild flavor. The plants do not seem thoroughly established, and this may account for the poor showing they have made.

Reyner was planted in 1896 and has made a strong growth, and during the past season produced a good crop of fruit. The berries were rather small, varying from oblong to oval in form, and were rather compact and with a plentiful amount of juice; flavor sprightly and pleasant. If, after the plants have become better established, the size of the fruit is increased, it promises to be a valuable variety, either for home use or market.

Sanford made a comparatively weak growth, but was fairly productive, although the berries were rather small in size. The clusters were quite large, moderately compact, and the fruit ranged from oblong to oval in form. Rather firm and with a moderate amount of juice. Flavor pleasant and vinous, but not of high quality.

Thompson was among the earliest to ripen, and although the plants were not especially vigorous, they were quite productive. The berries were quite large, of an irregular, oblong form, and were borne in large, loose clusters. They were fairly firm and with a moderate amount of juice, but the flavor was slightly unpleasant. If it shows hardiness under average conditions, it may prove a valuable variety for market.

Of the common kinds, Kittatinny, Lawton, Snyder, Taylor, Western Triumph and Wallace all gave good crops, slightly excelling Agawam, Ancient Briton and Erie, although these kinds produced a fair amount of excellent fruit.

## CURRENTS.

The plantation of currants contains twenty-four varieties, most of them three years transplanted, although several new kinds have recently been added. The usual treatment with fungicides was made, the first application being given March 18, before growth had started, and as soon as the worms appeared, they were sprayed with Bordeaux mixture, for the prevention of fungi, and Paris green for the worms. This treatment sufficed to hold the insects in check and saved the foliage from the attack of fungi so that it remained upon the plants in a healthy condition long after all of the leaves had fallen from unsprayed plants. This enabled the bushes to ripen their wood as well as to form strong fruit buds for the crop the coming season. On the 2nd of June, aphides having appeared upon Long Bunch Holland and spreading to the surrounding

varieties, the infested bushes were sprayed with tobacco water, and further injury was thus prevented. The season was quite favorable to the currant crop, and a large yield was secured from most varieties. In former years some injury had been done by the currant stem borer, but by cutting away all infested branches and the thorough use of insecticides, the injury has been greatly reduced, although it is impossible to tell to what extent the destruction of the borers has been due to the spraying.

Of the older kinds, good crops have been secured from Cherry, Fay and Versailles, although they have been discarded by many persons as market varieties on account of the injury from the twig borers. Although distinct in their origin and with slight differences in bush and berry, there is a general resemblance between them. The bushes are of medium height and with stout shoots and thick, dark green, wrinkled leaves. The berries of Fay and Cherry are quite large, but the former, as a rule, has somewhat longer stems. The Versailles has berries somewhat smaller than those of the other varieties, but the length of the stem and the arrangement of the berries is similar to that of Fay. The large size of the berries will make these valuable kinds where they can be grown without danger from the twig borers, but where this cannot be held in check, all of them and Fay in particular, will be greatly injured.

TABULATION OF CURRANTS, 1898.

KEY: Form—r, roundish. Color—b, black, r, red, w, white. Use—d, dessert, k, kitchen, m, market.

Names.	Origin.	Planted.	Bloom.	Ripe.	Productiveness, 1-10.	Form.	Color.	Quality.	Vigor.	Weight in oz.	Use.
Champion.....	England.....	1859	May 3	7 12	10	r	b	8 6	7 8	2-12	mk
Cherry.....	Europe.....	1888	April 28	7 5	10	r	b	5 6	8 9	2-8	m
English.....	England.....	1892	May 8	7 9	10	r	b	5 6	10	2-10	mk
Fay.....	New York.....	1888	April 28	7 5	10	r	r	6 7	6	2-6	mk
Holland.....	Europe.....	1889	" 29	7 15	10	r	r	5	9 10	2-10	mk
Lakewood.....	Ohio.....	1890	" 27	7 05	5	r	r	6 7	7 8	2-6	mk
Lee.....	America.....	1888	May 3	7 12	7 8	r	b	3 4	4 5	2-20	mk
London.....	England.....	1890	" 1	7 9	10	r	r	4 5	9 10	2-10	mk
North Star.....	Minnesota.....	1890	April 27	7 5	9 10	r	r	7 8	10	2-10	mk
Pomona.....	.....	.....	" 29	7 11	1 2	r	r	7 8	4 5	2-14	mk
Red Dutch.....	Europe.....	1888	" 27	7 11	7 8	r	r	7 8	10	2-8	dk
Ruby Castle.....	Europe.....	1892	May 1	6 25	9 10	r	r	6 7	9	2-10	dk
Ruby, Moore.....	New York.....	1890	April 27	7 9	9 10	r	r	7 8	6 7	2-4	dk
Saunders.....	Ontario.....	1890	May 4	6 30	7 8	r	b	3 4	9 10	2-10	mk
Select, Moore ..	Massachusetts..	1890	April 27	6 20	7 8	r	r	5 6	8 9	2-6	mk
Versailles.....	France.....	1888	" 27	6 22	8 9	r	r	6 7	8 9	2-6	mk
Victoria.....	England.....	1888	May 2	6 23	8 9	r	r	5 6	9 10	2-6	mk
Wales, Prince of	Ontario.....	1890	" 3	7 14	7 8	r	b	5 6	8 9	2-8	mk
White Dutch.....	Europe.....	1888	April 27	7 7	7 8	r	w	10	8 9	2-8	dk
White Gondoin..	Europe.....	1890	" 28	7 11	4 5	r	r	8 9	8 9	2-8	dk
White Grape.....	Europe.....	1898	" 29	7 9	6 7	r	w	8 9	7 8	2-6	dkm
Wildor.....	New York.....	1890	" 27	7 1	8 9	r	r	6 7	8 9	2-9	mk

Long Bunch Holland is somewhat later than the varieties above mentioned, but seems to have no advantages over them except that it is less injured by the borers. On the other hand, it is very subject to the

attack of plant lice, which cause the leaves to roll and take on a dull red color. The fruit is borne on moderately long stems, but the berries are comparatively small. The plants are vigorous and are less injured than most other varieties by currant worms and the leaf spot diseases.

Lakewood is a vigorous, upright-growing sort that in plant and fruit resembles Cherry. The clusters vary in size, although as a rule there is a long stalk between the fruit spurs and the base of the cluster. Although evidently a hardy variety, it has not equaled those above mentioned in productiveness.

London is one of the most promising of the new varieties for either home use or market. The plants are tall, upright or slightly spreading, and are quite healthy and vigorous in growth. The stalk is long and with a comparatively compact cluster of large berries. From the fact that it is less injured by the leaf spot diseases and the twig borers than most other kinds it is a valuable variety for market, although the flavor of the fruit is not equal to that of some of the other varieties.

North Star is a recently introduced variety from Minnesota, which has shown itself quite productive and vigorous in growth. The stalk is medium to long, the clusters moderately compact and the berries of good size. The quality of the fruit is good.

Pomona, a recently introduced variety, has not been sufficiently tested to determine its value, although it has in some sections shown itself to be quite productive. The berries are of medium size and with moderately long stalks and clusters. It is dark red in color, and of high quality, comparing well with Red Dutch. The other red varieties have not differed in behavior from those previously reported. With good care, Red Dutch and Victoria have given excellent results, as they have been less injured by the borer than other varieties. When the bushes are properly pruned and sprayed and have good cultivation, with plenty of fertilizer, the berries compare well with most other varieties, and the quality of the Red Dutch is fully equal to any of the other kinds.

Wilder had again shown itself to be a valuable variety, comparing well in every respect with the other large-fruited kinds.

### GOOSEBERRIES.

The treatment of the gooseberries was similar to that given the currants so far as the spraying was concerned, except that they require rather more care in order to control the powdery mildew. The early sprayings with Bordeaux mixture and Paris green were followed with five applications of potassium sulphide, used at the rate of three ounces in ten gallons of water, the first being made upon the 17th of May and the others at intervals of about ten days. For the most part these later applications were not necessary upon the varieties of American origin, but as the plantation included a large number of European varieties which are very subject to the attack of mildew, in our hot, dry summers, the sprayings mentioned above were for the most part necessary. The expense of the material is comparatively small and the cost of applying it is slight. On the other hand, the benefits were very marked, as, in the case of varieties which when left unsprayed would have lost the entire crop, and at best would have made a weak and unhealthy growth, a large

yield of very fine fruit was secured. Many of the varieties averaged from one-fourth to one-third of an ounce in weight for the single fruit. Although grown under exactly the same conditions at the other sorts, for some unknown reason, the kinds that have usually been most productive were least so in 1898, as Downing, Smith, Houghton and Pale Red bore but few fruits, while Keepsake, Apex, Lancashire and others of the European varieties gave good crops. Although slight differences can be detected in both the plant and the shape and color of the fruit, there is a close resemblance between many of the varieties of *Ribes grossularia*, the European gooseberry. Of the varieties under trial, Keepsake and Lancashire have given the best results. The plants are of vigorous growth with stout branches and thick, dark green leaves. The fruit in both cases is large, averaging one-third of an ounce. In Keepsake they are yellowish green, with slight brown cheek on the exposed side, and vary in form from oval to ovate, while those of the Lancashire are of a rather long-oval and are green with a dull red blush. The veins in both cases are quite distinct and of a pale green color. The flavor is mild and pleasant and the juice abundant. Of the other varieties, Auburn, Chautauqua, Columbus, Industry and Triumph gave fairly good results, although they were less productive than those above mentioned. All of these except Triumph are of a yellowish-green, with distinct yellow or yellowish-white veins. Most of them are of a roundish-oval form, but Columbus is nearly spherical. Of the American varieties, Downing has been most commonly grown and is generally successful. Of the new sorts, Pearl and Champion, which have a general resemblance to Downing, seem to have much promise, although in size they are considerably smaller than the European sorts, their weight being less than one-half as much. The general characteristics of the other varieties can be ascertained from the accompanying table and from previous reports.

TABULATION OF GOOSEBERRIES, 1888.

KEY: Form—l, long; o, oval; r, round. Color—g, green; r, red; w, white; y, yellow.

Names.	Species.	Planted.	Bloomed.	Ripened.	Form.	Color.	Weight in oz.	Productiveness—1-10.	Quality—1-10.	Vigor—1-10.
Apex .....	Grossularia .....	1898	May 1	7 25	o	yg	2-6	8 9	8 9	8 9
Auburn .....	Grossularia .....	1890	" 2	7 19	o	gr	2-6	8 4	8 9	5 6
Bendalon .....	Grossularia .....	1894	" 3	7 15	o	yg	2-15	2	6 7	8 9
Champion .....	Grossularia .....	1891	" 2	7 19	ro	gr	2-18	8 4	5 6	10
Chautauqua .....	Grossularia .....	1892	" 2	7 15	ro	gy	2-5	5 6	7 8	8 9
Columbus .....	Grossularia .....	1894	" 2	7 11	r	yg	2-3	4 5	9 10	9 10
Downing .....	Oxyacanthoides .....	1889	April 27	7 17	r to ro	gy	2-14	1	6 7	10
Golden (Prolific) .....	Grossularia .....	1891	May 3	8 1	lo	y	2-6	3	6 7	8 9
Houghton .....	Oxyacanthoides .....	1888	" 1	7 18	ro	r	2-32	3	10	10
Industry .....	Grossularia .....	1889	" 1	7 11	ro	r	2-6	3 4	6 7	7 8
Keepsake .....	Grossularia .....	1891	" 1	7 11	o	yg	2-4	6 7	8 9	9 10
Lancashire .....	Grossularia .....	1894	April 27	7 6	lo	gr	2-6	10	7 8	9 10
Orange .....	Grossularia .....	1890	" 27	7 9	r	yg	2-20	2	8 9	10
Pale Red .....	Oxyacanthoides .....	1888	May 2	7 9	ro	r	2-44	1 2	9 10	9 10
Pearl .....	Oxyacanthoides .....	1890	" 1	7 2	r	g	2-12	3 4	10	8 9
Red Jacket .....	Oxyacanthoides .....	1890	" 2	7 20	ro	r	2-12	3	7 8	9 10
Smith .....	Oxyacanthoides .....	1888	" 1	7 12	o	g	2-22	1	9 10	5
Strubler .....	Cynobati .....	1892	" 2	7 18	oro	gy	2-12	1	7 8	5
Tree .....	Cynobati .....	1892	" 4	7 25	ro	r	2-24	3	5 6	9 10
Triumph .....	Grossularia .....	1890	" 2	7 9	o to o	gy	2-6	3	6 7	8 9



## GRAPES.

In 1888 the first planting of grapes was made, and as new varieties could be secured, they have been added, until now the plantation numbers 150 varieties. The vines first planted were trained upon flat-topped trellises with the cross-arms about five feet from the ground. The vines were pruned with two arms in each direction, and frequent renewal has been practised. The later plantings have been provided with vertical trellises with two wires, the upper one being about six and the lower four and one-half feet from the ground. For the most part, the vines have been trained with four horizontal arms, the pruning and training being after the so-called Kniffin system. From the fact that no variety has been trained after both methods it is rather difficult to judge of the merits of two systems, but the vertical trellises certainly permit of the greater ease in cultivation, and during the past season the crop has been considerably larger than from the vines trained upon the horizontal trellises. On the other hand, the injury from downy mildew and other fungous diseases seems to be rather less upon the flat-topped trellis. The vines were sprayed with Bordeaux mixture before the buds opened, and on the 25th of July they received an application of a weak solution of sulphate of copper (one pound to two hundred and fifty gallons of water) to prevent the attack of powdery mildew and other fungous diseases. During the last week in August, oats were sown between the rows of grapes to provide a winter mulch and they seem well adapted to this purpose.

**Alice.** Vines quite vigorous. Clusters rather small, cylindrical; berries rather small, round; dark wine color with a lighter bloom; pulp quite tender, light green, vinous, rich, with plentiful juice, and a slight aroma; seeds few; quality good; season end of September. The vines are as yet quite young and have not shown themselves very productive; otherwise a promising variety.

**Bell.** Vines quite vigorous. Clusters of medium size, cylindrical, moderately compact; berries medium size, round, grayish, with a medium white bloom; pulp very tender, green, vinous, rich; juice plentiful; quality good; seeds few; season September to October. It seems quite productive, and except that the clusters are small, has some merit both for table use and market.

**Belvidere.** Vines quite vigorous. Clusters medium to large, cylindrical, shouldered, moderately compact; berries medium size, round, black, with a light blue bloom; pulp quite tender, greenish, sweet, with a plentiful juice and a slight aroma; quality fair to good; seeds few; season early September. Quite productive.

**Berlin.** A strong-growing hardy variety. Clusters large; berries large, round, greenish, with a slight whitish bloom; pulp tender, translucent, very light green, pleasant, sweet, vinous, with a slight foxiness; juice moderate; seeds few; quality fair to good; season last of September. If sufficiently productive it may prove a valuable white grape for market.

**Brighton.** Vines fairly vigorous, shoots medium to long jointed; leaves large, thick, dark green; fairly hardy. Clusters medium to large; long, shouldered, moderately compact; berries medium size, round or slightly ovate; color dark wine, becoming dark purple when fully ripe.

bloom thick, light colored; pulp tender, very juicy, greenish-yellow, vinous, rich, excellent, with a slight aromatic flavor; juice plentiful; seeds few; quality very good; season middle of September. Although it does not succeed in all locations, it is in most sections one of the most valuable of the red varieties for home use or market. To insure perfect pollination it should be planted adjacent to other varieties. The berries adhere well to the stems, but are rather tender for long shipment.

Campbell Early. Vines very vigorous, with a dark green foliage. Clusters large, cylindrical, shouldered; berries large, globular; color black with a beautiful blue bloom; pulp melting, greenish-yellow, rich, sweet and vinous, separating readily from the seeds; juice plentiful, colorless; seeds few; quality very good; season early September. One of the most promising of the new varieties either for home use or market. It seems to be of much promise as a shipping variety, and to be a good keeper.

Chidester No. 3. Vines strong growers. Clusters oblong, shouldered, loose, large; berries medium size, round, dark, nearly covered with a slight bluish bloom; flesh moderately tender, greenish-white, with a slight aroma; quality quite good; seeds few. Season last of September and first of October. Where sufficiently productive it would be a valuable variety for dessert purposes.

Chidester No. 4. Vines quite vigorous. Clusters medium size, roundish, shouldered, loose; berries large, round, often colored nearly black, with a plentiful blue bloom; pulp tender, pale green, vinous; juice plentiful; quality quite good; season middle of September.

Colerain. Vines quite vigorous, with large healthy foliage, quite free from mildew. Clusters large, conical, moderately compact; berries large, round, light green, with a delicate whitish bloom; pulp very tender, light green, very sweet and vinous, with colorless juice; seeds few; quality very good; season middle of September. A promising variety, especially for home use.

TABULATION OF GRAPES, 1898.

ABBREVIATIONS: Bunch: Form—c, compact; cy, cylindrical; r, roundish; s, shouldered. Berry: Form—o, oval; ov, ovate; r, round. Color a, amber; b, black; g, greenish; p, purple; r, reddish; w, white; y, yellowish. Season: b, beginning; m, middle; e, end.

No.	Name.	Species.	Bloomed.	Ripened.	Received from.	Vigor—Scale 1 to 10.	Productiveness—Scale 1 to 10.	Quality—Scale 1 to 10.	Bunch.		Berry.		
									Form.	Weight in ounces.	Form.	Size.	Color.
1	Adirondac	Lab. x Vin.	June 21	m Sept.	Ell. & Barry	6	10	4.5	cy os	4	ro	34	b
2	Algonquin	Lab. x Vin.	" 21	b Oct.	Hubbard	10	2	6.7	cy os	5	r	39	pb
3	Alice	Lab. x Vin.	" 21	b Sept.	T. J. Dwyer	8	4	7.8	cy	4	r	34	r
4	Aminia	Lab. x Vin.	" 20	m Sept.	Hubbard	7.8	3	7.8	cy s	5 1/2	r	78	b
5	Barry	Lab. x Vin.	" 21	b Oct.	Hubbard	9.10	1	7	ro s	5	r	78	b
6	Baldvire	Lab. x Vin.	" 19	b Sept.	Agricultural College.	6.7	9.10	4.5	cy s	5	r	56	b
7	Black Eagle	Lab. x Vin.	" 24	m Sept.	Hubbard	6.7	8.9	6.7	cy os	4	ro	78	b
8	Black Pearl	Vul. x Lab.	" 18	m Sept.	Agricultural College.	10	8	3.4	cy s	3	r	45	b
9	Brighton	Lab. x Vin.	" 23	m Sept.	Hubbard	8.9	4.5	10	cy s	5 1/2	r	56	b
10	Burnett	Lab. x Vin.	" 21	m Oct.	Ell. & Barry	7	7	7	cy s	5 1/2	ro v	56	b
11	Cambridge	Lab.	" 21	m Sept.	Barnhart	7.8	6.7	6.7	cy s	3 1/2	ro	67	b
12	Caywood 50	Lab.	" 19	e Sept.	Caywood	8.9	9	3.4	cy s	3	ro v	56	b
13	Chancellor	Lab. x Vin.	" 25	m Oct.	Campbell	6	10	10	cy s	3	r	34	w
14	Challenge	Lab. x Vin.	" 21	m Sept.	Barnhart	9.10	2	8.4	cy s	3	r	34	r
15	Childster 3	Lab.	" 23	b Oct.	Childster	7	4.5	9	cy s	3	r	34	r
16	Childster 4	Lab.	" 20	m Sept.	Childster	8.9	2	7.8	r s	4	r	78	b
17	Clinton	Vul. x Lab.	" 17	m Sept.	Hubbard	10	7	4	cy s	4	r	45	b
18	Colerain	Lab.	" 23	m Sept.	Campbell	6.7	5	8.9	cy s	5 1/2	r	47	w
19	Columbia	Vul. x Lab.	" 23	m Oct.	Ell. & Barry	4.5	4	4	r s	6	ro v	7.10	p
20	Columbian	Lab.	" 20	m Sept.	Farmer	7	7	4	r s	5 1/2	ro v	10	p
21	Concord	Lab.	" 21	m Sept.	Home	9.10	5	5.6	cy s	5 1/2	r	67	b
22	Corland	Lab.	" 19	b Sept.	Lambert	9	5	2.8	os	5 1/2	r	56	b
23	Cottage	Lab.	" 20	b Sept.	Hubbard	7.8	7	4.5	cy	4	r	56	b
24	Cottrell	Lab. x Vin.	" 17	m Sept.	Hubbard	10	4	5	cy	4	r	34	b
25	Delaware	Bour. x Lab.	" 20	e Sept.	Hubbard	8	7.8	10	cy os	3	r	23	r
26	Diamond	Lab. x Vin.	" 23	m Sept.	Chase	8	4.5	7.8	cy os	5 1/2	r	56	w
27	Diana	Lab. x Vin.	" 24	b Oct.	Hubbard	7	1	7.8	cy os	5	ro	56	r
28	Dorning	Aest. x Vin.	" 23	b Oct.	Hubbard	9	4.5	8.9	cy os	3	ro	56	b
29	Dreux	Lab. x Vin.	" 21	m Sept.	Hubbard	8.9	3	2.8	cy s	4	ro	68	a
30	Duchess	Lab. x Vin.	" 25	e Oct.	Hubbard	8.9	3	3	cy os	7	ro v	34	g y
31	Early Victor	Bour. x Lab.	" 21	m Sept.	Hubbard	10	5.6	7.8	cy os	4	r	45	b
32	Katon	Lab.	" 21	m Sept.	Hubbard	8	5.6	4	cy s	3	r	79	b

33	Elaine	Lab. x Vin.	June 21	m e Sept.	Engle	4	1	7 8	r	67	r
34	Elvira	Lab. x Vin.	" 19	m Oct.	Hubbard	9 10	10	4 5	r	67	r
35	Empire State	Lab. x Vin.	" 20	m Oct.	Hubbard	8	4	5 1/2	r	84	r
36											
37	Ether	Lab. x Vin.	" 22	b Oct.	Joselyn	7	11	6	r	67	r
38	Eva	Lab. x Vin.	" 19	b Oct.	Hubbard	7	10	4 5	r	68	r
39	Guineas	Lab. x Vin.	" 20	b Oct.	Hubbard	10	7	4 5	r	68	r
40	Guineas	Lab. x Vin.	" 21	m Sept.	College	9	3	7 8	r	108	r
41	Golden Gem	Lab. x Vin.	" 21	b Oct.	Chase	9 10	8	8 9	ov	108	ov
42	Goldstein	(Bour. x Lab.) x Vin.	" 19	m Sept.	Campbell	7	7	10	r	34	r
43	Guineas	Lab. x Vin.	" 20	e August	Thompson	7 8	2	6 7	r	34	r
44	Hall	Lab. x Vin.	" 21	m Sept.	Engle	7 8	5	6 7	r	9 10	r
45	Harford	Lab.	" 20	m Sept.	Hubbard	9 10	4 5	8 4	r	5 6	r
46											
47	Hayes	Lab.	" 20	m Sept.	Hubbard	7	1	6 7	r	34	r
48	Herbert	Lab. x Vin.	" 21	m e Sept.	Hubbard	8 9	3	6 7	r	7 8	r
49	Honey	Lab. x Vin.	" 21	m e Sept.	Engle	7	10	7 8	r	6 7	r
50	Hosford	Lab.	" 24	m Oct.	Hosford	9	5	10	rov	5 6	rov
51	Iona	Lab. x Vin.	" 19	b Oct.	Hubbard	10	4 5	8	r	6 7	r
52	Isabella	Lab.	" 21	b Oct.	Hubbard	9	8 9	3 4	r	6 7	r
53	Jefferson	Lab. x Vin.	" 20	b Oct.	Hubbard	6	7	8 9	r	4 5	r
54	Jessica	Bour. x Lab.	" 24	m Sept.	Smith	8	7	6	r	4 5	r
55	Jewell	Bour. x Lab.	" 24	m Sept.	Stayman	8 9	8 9	6 7	r	34	r
56	Joselyn 5	Lab. x Vin.?	" 20	m Sept.	Hubbard	10	4 5	8	r	6 7	r
57	Joselyn 7	Lab.	" 25	b Oct.	Hubbard	9	8 9	3 4	r	6 7	r
58	Joselyn 8	Lab. x Vin.	" 23	b Oct.	Joselyn	7 8	9	10	r	4 5	r
59	Joselyn 9	Lab.	" 21	b Sept.	Joselyn	6	1	5 6	r	6 8	r
60	Joselyn 10	Lab.	" 21	b Sept.	Joselyn	4	1	4 5	r	5 6	r
61	Lady	Lab.	" 21	b Sept.	Joselyn	6 7	2	6	r	6 7	r
62	Leader	Lab.	" 20	b Oct.	Joselyn	9	10	8 9	r	7 8	r
63	Leavenworth	Lab.	" 21	m Sept.	Stayman	9 10	6	5 6	r	4 7	r
64	Lindley	Lab. x Vin.	" 20	e Sept.	Hubbard	8 9	1	8 7	r	6 8	r
65	Lutie	Lab.	" 21	m Sept.	Parry	9	6	3 4	r	5 7	r
66	Lyon	Lab.	" 30	m e Sept.	Chidister	7 8	9	8 9	r	7 8	r
67	Mason, Mrs.	Lab. x Vin.?	" 20	m e Sept.	Mason	7 8	7	6 7	r	8 9	r
68	Massasoit	Lab. x Vin.	" 21	b Oct.	Hubbard	8	1	6 7	r	5 6	r
69	Merrimac	Lab. x Vin.	" 20	b Oct.	Hubbard	9 10	2	7	r	6 8	r
70	Michigan	Lab. x Vin.	" 24	m Sept.	Engle	7	12	7 8	r	8 9	r
71	Millington	Lab.	" 20	m Oct.	Palmer	6	6	5	r	6 0	r
72	Mills	Lab. x Vin.	" 23	m Oct.	Ell. & Parry	8 9	5	10	r	6 0	r
73	Minnesota	Lab.?	" 21	m Oct.	Graham	8 9	6	4 5	r	5 6	r
74	Moore Early	Lab. x Vin.	" 19	e August	Hubbard	8 9	4	5	r	4 7	r
75	Moyer	Bour. x Lab.?	" 21	e Sept.	Hubbard	9	4	4 5	r	7 8	r
76	Naomi	(Lab. x Vul. x Vin.	" 17	m e Sept.	Hubbard	9 10	1	3	ro	34	ro
77	Onelda	Lab. x Vin.	" 22	m Oct.	Hubbard	7 8	8	6 7	r	5 6	r
78	Osage	Lab.	" 23	m Sept.	Stayman	7	1	5	r	6 8	r
79	Owosso	Lab.	" 21	m e Sept.	Ell. & Barry	8 9	1	4 5	r	8 9	r
80	Ozark	Est.	" 25	b Oct.	Stayman	9 10	4	6	r	4 6	r

TABULATION OF GRAPES, 1898.—Concluded.

No	Names.	Species.	Bloomed.	Ripened.	Received from.	Vigor—Scale 1 to 10.	Productiveness— Scale 1 to 10.	Quality—Scale 1 to 10.	Bunch.		Berry.		
									Form.	Weight in ounces.	Form.	Size.	Color.
80	Peabody	Vul.	June 21	b Sept.	Campbell	6.7	8	5.6	cy	5½	r	5.6	b
81	Pockington	Lab.	" 19	m e Sept.	Hubbard	7	5	2.7	cyos	3	r	6.7	r
82	Pockington	Lab.	" 20	b Oct.	Hubbard	7	5	6.7	cyos	7	r	6.9	w
83	Pouchkeep-ic	Bour. x Lab.	" 24	b Oct.	Hubbard	4	3	9.10	cyos	4	r	4.6	r
84	Pratties	Lab. x Vin.	" 24	m e Sept.	Hubbard	7.8	4	4.5	cyos	4½	r	4.7	g w
85	Preley	(Lab. x Vul.) x Lab.	" 19	m e Sept.	Munson	7.8	4	4.5	cyos	4	r	5.6	b
86	Progress (Norfolk)	Lab. x Vin.	" 22	b Oct.	Stayman	8.9	8	4.5	cyos	6	r	5.6	b
87	Renz	Lab.	" 21	b Oct.	Hubbard	10	1	2.4	rs	4	r	5.6	b
88	Requa	Lab. x Vin.	" 23	m Oct.	Campbell	8	10	7.8	cyos	4	r	6.7	p r
89	Rochester	Lab. x Vin.	" 21	b Oct.	Ell. & Barry	8	9	6.7	cyos	5	r	4.5	r
90	Rockwood	Lab.	" 19	m Sept.	Josselyn	7	7	7.8	cyos	8	r	4.5	b
91	Rogers 5	Lab. x Vin.	" 23	m e Sept.	Hubbard	7	1	7	r	5	r	7	r
92	Rogers 24	Lab. x Vin.	" 20	b Sept.	Hubbard	6.7	1	6.7	ros	5	r	6.7	r
93	Rogers 31	Lab. x Vin.	" 22	m Sept.	Hubbard	7	1	5	rs	3	r	5.8	b
94	Salem	Lab. x Vin.	" 19	b Oct.	Hubbard	7.8	3	5.6	cyos	4	r	7.10	b
95	Secretary	(Lab. x Vul.) x Vi.	" 20	m Oct.	Ell. & Barry	4.5	4.5	6.7	cyos	7	ov	4.6	b
96	Telegraph	Lab.	" 20	b Sept.	Hubbard	7	10	5	cyos	4.5	r	6.7	b
97	Themis (i. correct)	Lab. x Vin.	" 23	m Sept.	Engle	7.8	8	6.6	cyos	5½	r	6.7	b
98	Triumph	Lab. x Vin.	" 25	m Oct.	Campbell	7.8	10	8.6	cyos	10	r	7.8	g y
99	Uister	Lab. x Vin.	" 20	m Oct.	Caywood	4.5	4.5	9.10	cyos	4½	ov	6.7	r
100	Verg-nes.	Lab.	" 20	m Sept.	Hubbard	6	8.9	8.9	cyos	4	o	7.8	r
101	Vesta	Lab. x Vin.	" 24	m Oct.	Engle	7	4	3.4	r	3	r	7.8	g
102	Victoria	Lab.	" 24	b Oct.	Josselyn	7	9	6.6	cyos	9½	r	5.6	b
103	Warder	Lab.	" 21	b Sept.	Huber	5.6	1	3.4	cyos	7	r	4	b
104	Washington Lady	Lab. x Vin.	" 24	b Oct.	Hubbard	6.7	1	6.7	cyos	4	r	5.6	y w
105	Wells?	Est. Hybr.	" 20	b m Oct.	Robards	8.9	9.10	1.3	cyos	6½	ov	7.8	r
106	White Ann Arbor	Lab.	" 20	m e Oct.	Scott	7	1	6.7	cyos	8	r	4.5	w
107	White Beauty	Lab. x Vin.?	" 23	m e Sept.	Stayman	7	10	7.8	cyos	3½	r	4.6	w y
108	White Imperial	Lab. x Vin.?	" 23	m Sept.	Stayman	7	9	7.8	cyos	2	r	5.6	w
109	Wildor	Lab. x Vin.	" 20	b Oct.	Hubbard	6.7	8	7.8	ros	4	r	5.6	b
110	Willis	Bour. x Lab.?	" 20	m Sept.	Campbell	7	9	6.6	cyos	2½	r	5.6	w
111	Winchell	Lab. x Vin.	" 31	b Sept.	Ell. & Barry	7	3	9.10	cyos	4	r	5.6	g w
112	Wit	Lab. x Vin.	" 23	m e Sept.	Campbell	9.10	1	7.8	rs	3	r	5.9	g y
113	Woodruff	Lab. x Vin.	" 20	b Oct.	Scott	9.10	2.3	7.8	rs	3	r	7.8	r
114	Worden	Lab.	" 20	m e Sept.	Hubbard	10	4.5	7.8	cyos	6	r	7.8	b
115	Wyoming	Lab.	" 20	m Sept.	Hubbard	8	4	4	cyos	3	r	5.6	r

**Columbian.** Vines very vigorous, strong-growing, with large, thick, leathery leaves. Clusters medium to large, roundish, shouldered, loose; berries very large, roundish, oblate, reddish purple, with a plentiful bloom; pulp half tender, greenish, acid; quality rather poor; seeds quite numerous; season middle of September. Fairly productive. Aside from the strength of the vine it seems to have little value, either as a variety for home use or market.

**Concord.** Vines quite vigorous, hardy and healthy. Clusters large, cylindrical, shouldered, moderately compact; berries good size, round, black, with a plentiful blue bloom; pulp half tender, greenish, vinous, sprightly, with colorless juice, and a moderate aroma; seeds few, large; season middle of September. Generally quite productive and a reliable variety for all sections.

**Cortland.** Vines very vigorous. Clusters medium size, somewhat shouldered, rather loose; berries medium-sized, round, black with a light blue bloom; pulp very tender, greenish, with a plentiful juice, very foxy; quality poor; season early September. Fairly productive. The quality is so poor that it seems to be worthless.

**Cottage.** Vines quite vigorous, with large, leathery leaves. Clusters medium size, cylindrical, moderately compact; berries medium to large, round, black, with a light blue bloom; pulp rather tough, yellowish, not very juicy, foxy; seeds few, large; quality fair; season early September. Berries drop from the clusters soon after picking. Less valuable than Concord and Worden.

**Delaware.** Vines rather short, slender; growth short jointed; quite hardy. Clusters medium size, nearly cylindrical, shouldered, very compact; berries small, round, wine colored, becoming quite dark when fully ripe, with a bluish bloom; pulp tender, yellowish, or very light amber, very juicy, vinous, rich, sprightly, excellent; quality very good; seeds few; season middle to last of September. In favorable locations it is quite productive, and its high quality makes it one of the most valuable grapes for either home use or market.

**Diana.** Vines quite strong. Clusters medium sized, short, cylindrical, very compact; berries medium to large, roundish-oval, reddish-lilac, or light wine color, with a plentiful blue bloom; pulp rather tough, whitish, vinous, pleasant, with a foxy aroma at first which soon disappears; seeds few, rather large; quality good; season early October. Generally quite productive, but it ripens too late to succeed in most sections. Its principal value exists in its keeping qualities, which makes it possible to preserve the fruit until spring.

**Downing.** Vines quite vigorous. Clusters large to very large, long, conical, slightly shouldered, quite compact; berries medium to large, long, oval, black, with a very slight blue bloom; pulp tender, greenish-amber, with a moderate amount of juice; skin thick, but rather tender; seeds large, generally but one; quality quite good. Season late September or early October. Quite productive, and unusually free from mildew. Although rather late, it has some value on account of its long-keeping qualities.

**Duchess.** Vines very vigorous but with moderately short jointed shoots. Clusters medium to large, long, conical, shouldered, quite compact; berries small, roundish-oval, light green to pale greenish-yellow, dotted with diminutive brown specks; bloom slight, whitish, almost

transparent; when fully ripe the berries sometimes take on a golden yellow color; pulp tender, breaking, greenish, sweet, vinous, rich, spicy; juice moderate; seeds few; quality very good. Season early October. Generally quite productive.

**Early Victor.** Vines hardy, wood dark gray, rather long jointed; foliage healthy, thick, medium size, dark green, deeply lobed. Clusters small, oblong, conical, shouldered, moderately compact; berries rather small, round, black, with a medium bluish bloom; pulp rather firm, greenish-white, vinous, rather rich, pleasant, with a plentiful juice; seeds medium, quality quite good; generally quite productive. Season middle of September. Clusters rather small to make it desirable as a market variety, but its hardness, productiveness and high quality make it valuable for home use.

**Eaton.** Vines vigorous, strong and hardy, with large leaves. Clusters large, cylindrical, shouldered, quite compact; berries large, round, black, with a dense blue bloom; pulp half tender, green, hardy, vinous, very juicy; seeds few; quality fair. Season middle of September; fairly productive. Although the fruit is large and handsome, it is inferior to Concord in flavor and seems to have no merits over that variety.

**Empire State.** Vines quite vigorous. Clusters large, cylindrical, shouldered, quite compact; berries medium size, round, light green, with a thick white bloom; pulp tender, very light green, vinous, pleasant; seeds few; quality quite good. Somewhat lacking in productiveness in many sections, but where it succeeds it is a valuable table grape. Season early October.

**Esther.** Vines vigorous, quite healthy. Clusters medium size, cylindrical, moderately compact; berries large, round, golden yellow, with a whitish, nearly transparent bloom; pulp rather tough, yellowish-green, vinous, rich; juice colorless, not very plentiful; seeds few; quality fair; last of September or first of October; quite productive.

**Geneva.** Vines quite vigorous, strong-growing, healthy. Clusters medium size, cylindrical, loose; berries medium to large, obovate to oval, white or greenish-white, with a slight white bloom; pulp half tender, translucent when fully ripe, greenish white, sweet, vinous, with an abundant colorless juice and a slight aroma; seeds quite numerous; quality good; fairly productive. Season early October. A valuable white variety for home use or market.

**Golden Gem.** Vines somewhat lacking in vigor; wood short-jointed. leaves slightly separate, small to medium in size. Clusters small, cylindrical, shouldered, moderately compact; berries small, round, of a rich golden color, with a delicate white bloom; pulp half tender, light green; juice plentiful, colorless, very sweet; quality very good; fairly productive; seeds numerous, quite small. Season middle of September. Of no value for market, but on account of its high quality and handsome appearance, it is worthy of trial for home use.

**Goldstein.** Vines quite vigorous. Clusters medium size, short, cylindrical, shouldered, moderately compact; berries rather large, round, black with a thick bloom; pulp tender, light amber, pleasant, with colorless juice, and a slight foxy taste; quality good. Season last of August. The vines are small, and thus far have not shown any indications of productiveness.

**Hayes.** Vines quite vigorous, hardy, free from mildew, with short-jointed wood. Clusters medium size, cylindrical, shouldered; berries small, round, yellowish-amber, with a dense whitish bloom; pulp rather tough, light green, mild, rich, vinous, with an abundant colorless juice and a slight aroma; quality good, seeds few. Season middle of September. Generally lacking in productiveness.

**Herbert.** Vines quite vigorous and among the hardiest of Rogers' seedlings. Clusters medium to large, roundish, shouldered, moderately compact; berries large, round, black, with a dense blue bloom; pulp tender, greenish, sweet, pleasant, sprightly, with a plentiful juice; seeds few, large; quality good. Season middle of September. Usually quite productive. Valuable for home use and one of the best of the black varieties sent out by Rogers, for market.

**Honey.** Vines moderately vigorous, short-jointed, hardy. Clusters medium size, cylindrical, shouldered, moderately compact; berries large, round, greenish-yellow, with a slight whitish bloom; pulp rather tender, almost translucent, green, sweet, vinous, juicy, and a slight foxy aroma; seeds few, large; quality good; quite productive. A valuable dessert variety. Season middle of September.

**Hosford.** Vines strong and hardy. Clusters large and conical, shouldered, moderately compact; berries large to very large, round, black, with a medium blue bloom; pulp tender, greenish, sprightly, vinous, with a plentiful colorless juice; seeds quite numerous, large; quality good; generally quite prolific. Season early to middle of September. A promising sort either for home use or market.

**Janesville.** Vine, very vigorous, hardy and healthy. Clusters medium to large, short, shouldered, very compact; berries medium to large, round, black, with a slight blue bloom; pulp moderately tender, greenish, highly vinous, juicy; seeds generally numerous, large; quality rather poor. Of value only on account of its hardiness and vigor.

**Jefferson.** Vines fairly vigorous, wood rather short-jointed; leaves large, thick and downy. Clusters large, short, shouldered, moderately compact; berries medium size, round, black, wine-colored, with a slight blue bloom; pulp very tender, light amber, sprightly, vinous; seeds quite large, rather numerous; quality very good; generally productive. Especially valuable for home use on account of its high flavor and its long-keeping qualities. Season late September or early October.

**Jessica.** Vines fairly vigorous. Clusters of medium size, cylindrical, shouldered, moderately compact; berries medium to large, round, white to golden-yellow, with a slight whitish bloom; pulp tender, green, very sweet and pleasant; juice plentiful, seeds few and large for the size of the berry; quality good. A hardy and fairly productive variety of some merit for home use. Season first to middle of September.

**Jewell.** Vines moderately vigorous. Clusters small, cylindrical, shouldered, moderately compact; berries small, round, black, with blue bloom; pulp rather tough, whitish, vinous, sprightly and juicy; seeds numerous; quality good; season first to middle of September. While fairly productive and of good quality, the clusters are rather small.

**Josselyn No. 5.** Vines very vigorous. Clusters medium size, cylindrical, moderately compact; berries rather large, round, white, with a thin white bloom; pulp rather tender, yellowish-green, sweet, slightly acid; quality very good; seeds numerous. Season early October. A fairly



productive variety for home use or market. Apparently a hybrid between *vinifera* and *labrusca*.

Josselyn No. 7. Vines very strong. Clusters medium to large, cylindrical, shouldered; berries medium to large, round, pale green, with a light white bloom; pulp half tender, pale green, vinous, rather rich, with abundant juice; seeds small and few; season early October; quality very good; quite productive. A promising table grape, although it seems subject to the attack of mildew when unsprayed.

Joselyn No. 9-2-1. Vines quite vigorous. Clusters medium size, cylindrical, moderately compact; berries rather large, roundish, black with a plentiful blue bloom; pulp tender, light green, vinous, sprightly, with a plentiful colorless juice; seeds few. As yet somewhat lacking in productiveness, and likely to shell from the stems as soon as ripe.

Josselyn No. 10. Somewhat lacking in vigor. Clusters small, cylindrical, shouldered, rather loose; berries medium to large, roundish, black, with a thin bloom; pulp rather tough, light amber, sprightly, rather rich, with a plentiful juice and slight aroma; seeds few; quality fair. As yet somewhat lacking in productiveness. Season last of August and first of September.

Lady. Vines rather slow growing and slender, but hardy. Clusters medium size, oblong, somewhat conical and slightly shouldered, quite compact; berries medium to large, round, white or greenish-yellow, with a slight whitish bloom; pulp tender, whitish, vinous, with an abundance of juice and slight aroma; seeds few, small; quality good, season early September; fairly productive. A variety of some value for home use.

Leader. Vines rather vigorous. Clusters medium size, cylindrical, loose; berries medium to large, round, white, with a thin, whitish bloom; pulp firm, light green, vinous, sprightly, with a plentiful colorless juice, and a musky aroma; seeds few; quality fair. The vines as yet have not given indications of their productiveness.

Lindley. Vines fairly strong, but with rather long-jointed, slender canes, and with few laterals. Clusters rather small, long, shouldered, loose; berries medium to large, round, brick-red, with a lilac bloom; pulp rather tender, greenish, vinous, very pleasant, juicy; seeds few, large; season middle of September; generally fairly productive; quality good. A valuable variety for dessert purposes.

Lutie. Vines rather strong. Clusters medium size, long, cylindrical, very compact; berries large, round, pale to dark red, with a very thin bloom; pulp half tender, whitish, with colorless juice and foxy aroma; seeds few; quality poor; season middle of September. Somewhat lacking in productiveness, and hardly likely to become of value.

Lyon. A seedling originated by C. P. Chidester, Battle Creek, Mich. Vines very strong. Clusters medium to large, cylindrical, shouldered and moderately compact; berries quite large, round, white, with a moderate whitish bloom; pulp quite tender, greenish, sweet, rich and vinous, with an abundance of colorless juice; seeds few; quality very good; season last of September. A fairly productive and promising white grape for either home use or market.

Mason. Vines quite strong. Clusters medium size, cylindrical, occasionally shouldered and moderately compact; berries medium to large, round, light wine-color, with a medium whitish bloom; pulp half tender, light green, sweet, vinous, sprightly, not very juicy, aroma slight; quality

good; seeds few; season middle of September; fairly productive. The vines were sent for trial from Ottawa county; and while it appears to be a promising variety, further time is required to test it properly.

**Michigan.** Vines quite vigorous and hardy. Clusters medium size, cylindrical, shouldered, quite compact; berries large, round, pale green, with a thin whitish bloom; pulp half tender, green, moderately juicy and with a slight aroma; seeds few; quality very good. A promising variety for dessert purposes. Season middle of September.

**Millington.** Vines fairly vigorous. Clusters good size, roundish, shouldered, moderately compact; berries medium to large, round, black, with a blue bloom; pulp tender, very light green, quite sprightly, sweet, vinous, very juicy, with a perceptible aroma; seeds few; quality fair to good; moderately productive; season middle of September.

**Mills.** Vines quite strong and vigorous. Clusters large, long, shouldered, moderately compact; skin tough, thick, a good keeper; berries medium to large, round, black, with a light blue bloom; pulp tender, light green, vinous, rich, with a medium juice; quality very good; seeds few; season early October; fairly productive. A promising variety for home use on account of its high flavor and long keeping qualities.

**Monroe.** Vines fairly vigorous and hard, with firm, short-jointed wood. Clusters medium size, long, shouldered, loose; berries medium to large, roundish, oval, black, with a thin bluish-white bloom; pulp tender, light green, sweet, sub-acid, very juicy. seeds few; quality fair to good; season early October; fairly productive. promising for market purposes.

**Moore Early.** Vines rather strong. Clusters medium size, generally roundish, conical, rarely shouldered, moderately compact; berries large, round black, with a thin bloom; pulp rather firm, greenish, slightly vinous, quite juicy, with a slight foxy odor; seeds few; season early September; fairly productive. Although the clusters are rather small, and the berries soon drop from the stems, it is one of the best of the early black varieties.

**Moyer.** Vines fairly vigorous, but of a slender growth, young wood short-jointed; clusters small, cylindrical, shouldered, loose; berries small, round, dark wine color, with a dull grayish bloom; pulp tender, greenish, sweet, pleasant, vinous, very juicy; seeds few; quality fair to good; season early September; inferior in productiveness and quality to Delaware, which it somewhat resembles, but a hardy variety and one that would succeed where the other would fail.

**Naomi.** Vines quite strong. Clusters rather small, cylindrical, shouldered, short; berries medium to large, roundish-oval, black with a whitish bloom; pulp tender, juicy, greenish, tinged with red, highly vinous, with a plentiful juice and moderate aroma; seeds few; quality fair; season middle of September. Somewhat lacking in productiveness.

**Niagara.** Vines quite vigorous. hardy and healthy, with long-jointed stems, and large, thick, leathery, downy foliage. Clusters quite large, conical, shouldered, moderately compact; berries large, round or slightly elongated, greenish or yellowish white, with a slight whitish bloom; pulp half tender, greenish-white, vinous, sprightly, quite juicy; seeds numerous, rather large; quality good. Although it does not thrive equally well in all localities, it is one of the most valuable of the white varieties for home use or market purposes.

**Northern Light.** Vines rather strong. Clusters cylindrical, slightly shouldered, moderately compact; berries medium to large, round, greenish-white, with a thin whitish bloom; pulp half tender, greenish, mild, vinous, rich, very pleasant, with a medium amount of juice; the rather small seeds separate readily from the pulp; seeds few; quality good; ripe last of September. A promising variety if it proves sufficiently productive.

**Olita.** Vines moderately vigorous. Clusters small, cylindrical, shouldered, moderately compact; berries medium to large, roundish; color greenish, with a slight whitish bloom; pulp very tender, pale, very sweet and pleasant, and with considerable juice; quality good; seeds few. A weak growth of the vines was probably due to an attack of mildew, to which they seem somewhat subject. Although the fruit has some merit as a table variety, the small size of the clusters will prevent it from being used as a market sort. Season last of September.

**Oneida.** Vines fairly strong. Clusters small, cylindrical, shouldered, moderately compact; berries rather large, round, light wine colored, with a beautiful lilac bloom; pulp very tender, whitish, sweet and pleasant, juicy; seeds few; quality good; season early October; quite productive. A handsome and rather productive sort that may prove valuable for home use.

**Osage.** Vines fairly strong and apparently hardy. Clusters medium size, oval, moderately compact; berries large, round, black, with a medium blue bloom; pulp rather tough, greenish, sweet, sprightly, with an abundant juice and foxy aroma; seeds few, rather large; quality fair; season early October. Not likely to be worthy of extensive planting.

**Owosso.** Vines very vigorous. Clusters medium to large, round, shouldered, moderately compact; berries large, round, reddish-purple, with a slight lilac bloom; pulp tough, yellowish-white, highly vinous, with a plentiful colorless juice; seeds few, large; quality rather poor; season middle of September; only moderately productive. Of little value even as a market sort.

**Ozark.** Vines quite strong and hardy. Clusters large, cylindrical, shouldered, moderately compact; berries medium size, round, black, with a light blue bloom; pulp half tender, meaty, greenish, vinous, not very juicy; seeds numerous, large; quality rather poor; moderately productive; season middle of October, which makes it rather late for this climate.

**Peabody.** Vines hardy and rather strong; clusters medium size, cylindrical, fairly compact; berries medium to large, oval, black, with a medium blue bloom; pulp tender, greenish, acid, with a plentiful juice; seeds rather few; quality fair; season middle of September; fairly productive. Not likely to become generally valuable.

**Perkins.** Vines quite strong and healthy, with leathery leaves. Clusters small, conical, shouldered, fairly compact; berries medium to large, round, lilac or pale amber, with a thin whitish bloom; pulp tough, yellowish, moderate juicy, very foxy; quality poor; seeds numerous; season early October; fairly productive, but of too poor quality for any purpose.

**Pocklington.** Vines quite strong and vigorous, with pubescent leathery leaves. Clusters large, cylindrical, shouldered, quite compact; berries medium to large, round, golden yellow, with a whitish bloom; pulp tender, yellowish, with a medium colorless juice and slight foxy

armoia; seeds few, rather large; quality good, fairly productive; season early October. In some sections highly esteemed as a variety for either home use or market.

**Poughkeepsie.** Vines are weak and feeble in their growth. Clusters medium size, cylindrical, shouldered, very compact; berries medium, round, wine-colored, with a slight lilac bloom; pulp very tender, yellowish-green, vinous, sprightly, with a plentiful colorless juice; seeds few, small; quality quite good. While it is ordinarily quite productive, the lack of vigor in the vines, and the small size of the clusters make it of little value. Season early October.

**Prentiss.** Vines fairly vigorous, with rather short-jointed wood. Clusters large, cylindrical, very compact; berries medium to large, roundish-oval, yellowish or greenish white, with a slight white bloom; pulp half tender, light green, vinous, rich, with a medium amount of juice and a slight foxy aroma; seeds few; quality quite good; season early October; quite productive. A long-keeping variety that has some merit for home use.

**Presley.** Vines quite vigorous. Clusters small to medium, cylindrical, shouldered, quite compact; berries medium to large, roundish, oval, dark wine-colored, with a light blue bloom; pulp tender, yellowish, nearly sweet, with a moderate amount of juice; seeds few; quality fair to good; quite productive. Although of rather low quality, the vigor and productiveness of the vines may make it of some value for market purposes. Season middle of September.

**Rentz.** Fairly vigorous and healthy. Clusters medium size, shouldered; berries medium to large, round, dense black, with little or no bloom; pulp half tender, translucent, whitish, with a sweet, vinous flavor, and considerable colorless juice and foxy aroma; seeds numerous, large; quality rather poor; season middle of September. The berries drop from the vines as soon as they are ripe. A southern wine grape that is out of place in Michigan.

**Requa.** Vines moderately vigorous. Clusters large, cylindrical, shouldered, moderately compact; berries large, round, wine-colored, with a thick bluish bloom; pulp half tender, greenish, sweet, sprightly, with abundant colorless juice; seeds few; quality quite good. As it is only moderately productive, it is not likely to take the place of some of the older kinds.

**Rochester.** Vines fairly vigorous and hardy, with short-jointed wood and large foliage. Clusters large, short, conical, shouldered, very compact; berries medium size, roundish-oval to ovate, reddish-purple, with a slight white bloom; pulp half tender, greenish, sweet, vinous, rich, with a plentiful colorless juice; seeds few; quality good; only moderately productive; season middle of September.

**Rockwood.** Vines fairly vigorous. Clusters medium size, long, shouldered, moderately compact; berries medium to large, round, black, with a dense blue bloom; pulp tender, greenish, vinous, rich, with an abundant juice; quality quite good.

**Salem.** Vines quite strong and healthy, with large foliage. Clusters medium size, roundish, shouldered, compact; berries large to very large, round, dark chestnut, with a slight blue bloom; pulp half tender, greenish-yellow, vinous, sprightly, with a medium amount of juice and a slight aroma; seeds few; quality good. Although somewhat lacking in produc-

tiveness the past year, it is generally regarded as one of the best of Rogers' hybrids. Season middle of September.

Secretary. Vines moderately vigorous. Clusters small to medium, conical, slightly cylindrical, shouldered; berries medium to large, oval, black, with blue bloom; pulp firm and breaking, light amber, slightly vinous, with a moderate amount of juice; seeds medium size, few; quality good; fairly productive. From its liability to mildew, it has been considered an unprofitable variety.

Telegraph. Vines rather strong. Clusters large to very large, cylindrical, shouldered, very compact; berries medium to large, round to oval, black, with bluish bloom; pulp tough, white, sprightly, highly vinous, juice abundant, aroma slight; seeds few; quality fair; quite productive; season early September. The low quality of the variety and its tough pulp make it of little value even for market purposes.

Triumph. Vines quite vigorous. Clusters very large, long, cylindrical, shouldered and moderately compact; berries large, roundish-oval, pale green or golden yellow, with a delicate whitish bloom; pulp tender, transparent, delicate, very juicy, bright green, rich and vinous; seeds few; quality quite good; rather productive; season middle of October. A valuable variety, either for market of dessert purposes, where it can be ripened, but rather late for most parts of Michigan.

Ulster. Vines fairly strong, short-jointed, with a thick, leathery foliage. Clusters medium to large, cylindrical, compact; berries large, round, red, with a slight bluish bloom; pulp tender, greenish, vinous, rich; seeds few; quality very good; rather productive; season early October. Although not likely to be generally valuable for market, its high quality makes it desirable for home use.

Vergennes. Vines hardy, moderately vigorous and healthy, with large, downy leaves. Clusters medium to large, long, slightly shouldered, rather compact; berries large, oval, amber to red, with a medium grayish bloom; pulp tender, greenish, vinous, pleasant, rich, with a fair amount of juice; seeds few; quality good; season last of September; quite productive. Valuable for home use on account of its long keeping qualities.

Victoria. Vines quite vigorous. Clusters large, cylindrical, shouldered, moderately compact; berries medium to large, roundish-ovate, white, with a slight whitish bloom; pulp half tender, greenish, sweet, vinous, rather rich, quite juicy and with a foxy aroma; seeds few, large; quality good; fairly productive; season middle of September.

Warder. Vines rather weak, but healthy. Clusters medium size, cylindrical, shouldered; berries medium to large, round, black, with a slight bluish bloom; pulp tender, yellowish-green, mild, vinous, with a plentiful colorless juice and a foxy aroma; seeds few; quality rather poor; only moderately productive; season early October. Seems to have no value.

Washington, *Lady*. Vines rather strong, with short-jointed shoots; leaves large, roundish, coarsely serrate occasionally lobed. Clusters large, long, broad, often doubly shouldered; berries medium to large, round, yellowish-white, with a thin whitish bloom; pulp tender, greenish, vinous, sprightly, moderately juicy; seeds few, rather large; quality good; season early October. Somewhat lacking in productiveness, but a valuable grape in some sections for home use.

**Wells.** Vines fairly vigorous. Clusters large cylindrical, shouldered, moderately compact; berries large, roundish-oval, wine-colored, with a plentiful bloom; pulp tender, green, mild, with a peculiar unpleasant flavor, very juicy and with a foxy and disagreeable aroma; seeds numerous; quality very poor; season first of October; quite productive. The very poor quality of the variety unfits it for any use.

**White Beauty.** Vines vigorous, with thick healthy foliage. Clusters medium size, cylindrical, shouldered, quite compact; berries medium size, round, white or golden yellow, with a light whitish bloom; pulp tender, greenish, sweet and vinous, with a plentiful colorless juice; seeds few; quality good; ripe last of September. Valuable for dessert purposes, if at all.

**White Imperial.** Vines quite vigorous. Clusters small, cylindrical, shouldered, moderately compact; berries medium size, round, white, with a plentiful white bloom; pulp half-tender, greenish, spicy, sweet, pleasant, with a plentiful juice; seeds few, small; flavor quite good; season last of September. It bears some resemblance to White Beauty.

**Wilder.** Vines vigorous, fairly hardy, but subject to attack of mildew. Clusters large, conical, shouldered; berries large, round, black, with a light blue bloom; pulp half tender, pale amber, vinous, pleasant; seeds few, large; quality quite good; season early October. A valuable variety for home use.

**Willis.** Vines quite vigorous. Clusters medium size, prominently shouldered, very compact, pale green or amber-yellow, with a slight bloom; pulp very tender, pale greenish, slightly vinous, very juicy, with a slight foxy aroma; seeds medium in number, large; quality good; season early September; generally quite productive. Of possible value as a market variety.

**Winchell.** Vines quite vigorous. Clusters medium to large, long, shouldered, moderately compact, color greenish-white, with a slight bloom; pulp rather tender, green, sweet, rich, quite juicy; seeds few, medium size; quality very good; season early September; quite productive. The best early white grape for home use or market purposes; it also holds its quality well after maturity. Green Mountain is identical with this variety.

**Witt.** Vines quite vigorous, hardy and healthy. Clusters medium size, conical, shouldered; berries medium to large, roundish, greenish-white or yellow at maturity, with a thin whitish bloom; pulp very tender, yellowish, sweet and vinous, with an abundant juice and a slight aroma; seeds few; quality quite good; season last of September.

**Woodruff.** Vines quite strong-growing. Clusters medium size, roundish, shouldered, quite compact; berries large, round, red, with a thin whitish bloom; pulp rather firm, whitish, mild, sweet and vinous, with a plentiful colorless juice and a foxy aroma; seeds few; quality fair; moderately productive; season last of September or first of October. Although it succeeds well in some places, it cannot be generally recommended for market, as it is quite variable in quality and the bunches are frequently quite small or imperfect.

**Worden.** Vines quite vigorous. Clusters large, long, shouldered; berries round, black, with a thin blue bloom; pulp moderately firm, greenish-white, vinous, pleasant, with a plentiful juice; seeds few; quality quite good; season early September; quite productive. Nearly a week

later than Concord, and hence more desirable than that variety for the northern part of the state, and on account of its superior quality, it is everywhere preferred to the Concord for home use or local market.

**Wyoming Red.** Vines vigorous, healthy and hardy. Clusters rather small, cylindrical, shouldered, moderately compact; berries medium size, round, dark wine color, with an abundant whitish bloom; pulp moderately firm, yellowish, sprightly, with a colorless juice and very foxy; seeds few; quality rather poor; season middle of September. Although it is quite hardy, and hence of some merit for the northern part of the state, yet its poor quality renders it undesirable where better kinds can be grown.

## APPLES.

In addition to the spraying with copper sulphate solution, before the buds started, the trees were sprayed with Bordeaux mixture, after the flower buds had appeared, but before they opened, for the prevention of scab. This treatment is of even more value than those made either earlier or later, as the fruit stalks are particularly subject to the attack of the apple scab fungus, and if the conditions at the time of blossoming favor the development of the disease, the crop is often destroyed, but if the trees are sprayed just before the flowers open, the attack can be prevented. On June 2, another spraying with Bordeaux mixture and Paris green was given the trees for the destruction of the larvæ of the codling moth as well as for preventing the scab. Other sprayings were made upon the 20th of June and upon the 22nd of July. On June 4th the presence of the woolly aphid being detected upon some of the trees, they were sprayed with kerosene emulsion and wood ashes were later on scattered about the trees at the rate of one bushel per tree. Although a large number of the varieties were old enough to give a fair crop, comparatively few of the trees blossomed. The following are descriptions of the varieties that fruited this year:

**Battullen.** Trees spreading and of vigorous growth; the fruit which ripened the latter part of October, weighed five and one-half ounces; form roundish, oblate, with a deep, slightly irregular basin, and a narrow, deep and regular cavity; stalk one inch long and of medium size; calyx slightly open; segments long, reflexed and woolly; calyx tube long, funnel shaped; color clear yellow, with a carmine blush and marblings and blotches of russet and clear green on a yellow ground; dots numerous and oblong, brown; flesh whitish, very juicy, tender, with a sprightly, acid flavor; quality good. This promises to be one of the best of the late-keeping winter varieties, and if sufficiently productive, will be a valuable kind for market in sections where hardness is of importance.

**Borovinka.** Trees vigorous, rather upright, with quite strong shoots, of a dark olive brown, quite downy; fruit roundish, oblate, with an average weight of eight ounces; ripe August 10; cavity broad and deep, slightly corrugated; stalk stout, seven-eighths of an inch long; basin broad, shallow, with a large conical calyx tube, and with a large and nearly closed calyx of which the segments are long and the tips reflexed; core medium, closed; flesh white, juicy and of a brisk, sub-acid flavor; texture tender, breaking, rather coarse; color pale red, washed with dull red in the sun and conspicuously striped with darker red when fully

exposed. In tree and fruit much like Oldenburg, but it may prove to be a distinct and productive culinary variety. Season September.

**Bottle Greening.** Tree quite vigorous, spreading; fruit large, oblate, inclined to conic; basin medium, slightly corrugated; cavity broad and deep; calyx small and closed; color greenish-yellow, shaded with dull crimson in the sun, and thinly sprinkled with light dots and specks; core small; flesh white, tender, sub-acid, almost melting. Season January to February.

**Bradford's Best.** Tree quite vigorous and of an upright habit; fruit large, roundish, slightly conical, with a deep, narrow and abrupt cavity and a narrow, abrupt and corrugated basin; stalk of medium size, three-fourths to one inch long; calyx small, closed; calyx tube large, funnel shaped; color greenish, washed, dappled and sparingly striped with dull, purplish red and specked and dotted with russet, thickly sprinkled with large, irregular dots, having gray centers. Season December to March.

**Canada Baldwin.** Tree very vigorous, upright with spreading branches; fruit large, oblate, slightly angular; cavity deep, slightly irregular and rather large; basin large, deep and corrugated; stalk one-half to three-fourths inches long, slender; color whitish, thickly striped and splashed with rich red and crimson, purplish crimson where fully exposed and having a slight bloom and many regular, pinkish dots and specks; calyx closed or slightly open, small; calyx tube long, funnel shaped; flesh very white, juicy, mild, sub-acid and a quince-like flavor; core medium, open; seeds plump, pointed; quality good, valuable for dessert or market purposes. Season December to April.

**Cogswell.** Trees quite vigorous, upright rather spreading; fruit large, roundish, conical, somewhat oblate; cavity broad, deep, acute with a brownish russet; basin very narrow, shallow, corrugated; stalk one-half to one-inch in length, medium size; calyx irregular, nearly closed; calyx tube conical; color pale yellow, mostly covered with red, striped and dappled with darker red and sometimes more or less overspread with rough, brownish russet, with many dots and specks, increasing towards the eye; flesh white, moderately juicy; aromatic, mild, sub-acid, rich, crisp, tender, fine grained. Season November to March.

**Cornell.** Tree a strong, upright grower; fruit medium size, roundish, conical, with a deep, acute, regular cavity and a narrow, abrupt, shallow and flat basin; stalk one and one-eighth inches long, slender; color yellow, with a pale red blush over most of the surface, and with broken stripes of darker red and faint marblings of russet; calyx open; calyx tube short, conical; flesh white, moderately juicy; core compact; seeds few; flavor mild, sub-acid; texture tender, fine grained. Season September.

**Gano.** A very vigorous growing tree, with a roundish head; fruit conical, somewhat ribbed; cavity broad, deep, ribbed, grayish brown; basin narrow, abrupt, corrugated; stalk three-fourths inch long, stout; calyx with short erect segments, generally slightly open; calyx tube funnel shaped; color yellow, nearly covered with dull red, splashed and briskly striped with darker red; core slightly open, small; seeds roundish, ovate, plump; flesh a faint yellowish white; sprightly, sub-acid, crisp, tender, juicy. Season October to March.



## TABULATION OF APPLES—1898.

## Fruit Matures.

ABBREVIATIONS—Month: b, beginning; e, end; m, middle. Form: o, conical; i, irregular; o, oblate; ob, oblong; ov, ovate; r, roundish. Color: g, green; r, red; ru, russet; a, striped; y, yellow. Texture: c, crisp; d, dry; f, firm; j, juicy; t, tender. Flavor: a, acid; m, mild; s, sweet. Use: c, cider; d, dessert; k, kitchen; m, market.

No.	Names.	Origin.	Planted.	Vigor.	Bloomed.	Ripe.	Season.	Weight in ounces.	Form.	Color.	Texture.	Flavor.	Quality—Scale 1 to 10.	Use.
1	Babbitt	Missouri?	1890	8	May 14	e Oct.	Nov. Dec.?	2	o r o v o	y r ru	f c j	s	9	m
2	Bell's Sweet	New York?	1898	8	" 19	b m Oct.	Nov. Mar.?	23	r o	r r	f c j	s	9	d m
3	Batillon	Russia	1898	10	" 19	e Oct.	Nov. Mar.?	8	r o	y r ru	f c j	s	9	d m
4	Borovinka	Russia	1898	8	" 13	e Aug.	Sept.	8	r o	y r ru	f c j	s	9	d m
5	Bottle Greening	Vermont	1890	10	" 16	e Oct.	Jan. Feb.	8	o o	y r	f c j	s	9	p
6	Bough	America	1898	9 10	" 16	e Aug.	Sept.	45	r o	y	f j	s	10	d k
7	Bradford	Tennessee	1890	8	" 16	e Nov.	Dec. Mar.	45	r o	y r ru	f o	s	9	d m
8	Canada Baldwin	Quebec	1890	10	" 16	e Oct.	Dec. Mar.	5	o	y r ru	f o	s	9	d m
9	Chenango	New York	1898	9 10	" 13	e Aug.	Aug. Sept.	45	ob o	y r ru	f j	s	9	p
10	Clayton	New York	1892	10	" 13	e Oct.	Dec. Dec.?	45	o	y r ru	f j	s	9	m
11	Cogswell	Connecticut	1898	9 10	" 19	m Sept.	Nov. Mar.	8	r o o	y r ru	f j	s	9	d m
12	Colton	Ohio?	1898	8 9	" 13	e Aug.	Sept.	4	o c i	y r ru	f j	s	9	d m
13	Cornell	Pennsylvania	1890	8	" 17	m Sept.	Sept.	4	r o	y	f j	s	9	d
14	Day	Nebraska	1891	7	" 16	e Sept.	Oct. m Nov.	5	r o	y r ru	f j	s	9	d m
15	Dyer	France?	1895	7	" 14	m Sept.	Sept. Oct.	5	r o	y r ru	f j	s	9	d m
16	Fink	Ohio	1892	8 9	" 13	e Oct.	Dec. Dec.	4	o	y r ru	f j	s	9	m
17	Gano	Missouri	1890	9 10	" 16	b m Sept.	Oct. May	9	o o i	y r ru	f j	s	9	k m
18	Garden Royal	Massachusetts	1898	9 10	" 17	m Sept.	Sept. Oct.	3 75	r o o	y r ru	f j	s	9	d
19	Gideon	Minnesota	1890	10	" 14	b Sept.	Sept. Jan.	5 5	r o	y r ru	f o	s	9	k m
20	Gill	Minnesota	1892	9	" 19	e Oct.	Oct. Apr.?	9 25	r o	y r ru	f o	s	9	m
21	Glouce	Wisconsin	1898	7 8	" 13	Nov.	Dec. Mar.	6 5	ov ob	y r ru	c	s	4	m
22	Golden Russet, N. Y.	England	1898	9	" 13	Dec.	Dec. Apr.	5 5	r o	y r ru	f j	s	7 8	d m
23	Grimes	Virginia	1890	10	" 16	Dec.	Dec. Apr.	6	r ob	y	f j	s	8 9	d m
24	Graeb	Pennsylvania	1890	8	" 17	m Sept.	Sept. Oct.	7	r o	y r ru	c	s	7 9	k m
25	Hass	Missouri	1892	7 8	" 16	b Sept.	Sept. Oct.	5	o o	y r ru	c	s	5 6	k m
26	Hagencourt	Europe	1898	10	" 15	b m Sept.	Sept.	6 5	r ov	y r ru	f	s	5	m
27	Hubbardston	Massachusetts	1898	9	" 15	m Nov.	Nov. Feb.	8	r ov	y r ru	f j	s	8 9	d m
28	Indian?	America	1892	10	" 19	m Sept.	Sept. Jan.	6	r o c	y r ru	f o	s	4 5	m
29	Iowa Keeper	Iowa	1891	9 10	" 17	Dec.	Dec.	5 28	o	y r ru	f	s	4 5	m
30	Jeffers	Pennsylvania	1895	9 10	" 19	e Aug.	m e Sept.	4 75	r o c	y r ru	f j	s	10	d m

31	Jersey Seed.	1888	9	17	b Sept.	Sept. b Oct.	5	r o	y r s	t j	s	5 6	d k
32	Jonathan	1888	7 8	18	m Aug.	Nov. Mar.	8	r o	y r	t j	s	10	d k m
33	Keewick	1888	7 8	18	e Aug.	Nov. Sept.	8	r o v	y r u	t j	s	5	k m
34	Kirkland	1890	7 8	16	e Oct.	Sept. May	4 5	r o o	y r u	t j	s	7 8	d k m
35	Longfield	1892	8 9	13	e Sept.	Sept. Oct.	6	r o	y r u	t j	s	5	d k m
36	Louise	1890	9	16	b Nov.	Nov. Jan.	6	r o	y r	t j	s	7 8	d m
37	Lowell	1890	9 10	14	b Sept.	Sept. Oct.	7 5	r o b	y	t j	s	7 8	d m
38	Lox	1890	8	19	m Oct.	Nov. Jan.	6 5	r o	y r s	t j	s	5 6	d m
39	Malden Blush	1898	9	15	m Aug.	e Aug. e Oct.	4 5	r o	y r s	t j	s	6 7	d m
40	Marmalade	1898	7 8	15	e Aug.	Sept. Oct.	4 5	r o b	y r s	t j	s	8 4	k
41	Mason Orange	1890	8 9	19	Nov.	Nov. Jan.	8 5	r o	y	t j	s	5 6	d m
42	Minkler	1892	8	14	Jan.	Jan. Mar.	6	r o	y r	t j	s	6 7	d m
43	Nero	1890	9	16	e Oct.	Jan. May	5 5	r o o	y r u	t j	s	6 7	d m
44	Northfield	1890	9	15	m Sept.	Sept. Dec.	4 5	r o	y r s	t j	s	7 8	d m
45	Oakland	1898	8	13	e Oct.	Nov. Mar.	6	r o	y r s	t j	s	7 8	d m
46	Oldenburg	1892	8	12	m Aug.	Sept.	7 7 5	r o	y r	t j	s	4 5	d m
47	Ontario	1890	9	18	Jan.	Jan. Apr.	8 5	r o	w y r s	t j	s	6 7	d m
48	Primite	1898	10	15	m Aug.	Aug. Oct.	8 5	r o	y r	t j	s	9	d m
49	Pryor Red Seedling	1898	9	16	e Oct.	Jan. Mar.	7	r o	y r u	t j	s	5 6	d m
50	Quince Cole	1892	9 10	16	b Sept.	Sept. Oct.	6	r o	y	t j	s	4 5	d m
51	Red Apont	1898	10	14	b m Sept.	Sept. m Nov.	9 5	r o	y r s	t j	s	5	k
52	Red June	1892	9 10	21	m Aug.	Aug. Mar.	4 23	r o	y	t j	s	7 8	d k m
53	Rhode Island	1898	8	13	m Oct.	Dec. Mar.	9	r o	y r	t j	s	7 9	d k m
54	Ribeton	1898	8	13	m Sept.	Nov. Apr.	5 5	r o	y r u	t j	s	7 8	d k m
55	Roxbury	1898	10	16	Jan.	Jan. June	6	r o	y r u	t j	s	7 8	d k m
56	Scarlet Cranberry	1891	8 9	16	Oct.	Dec. Apr.	6	r o	y r s	t j	s	5	d m
57	Sherrif	1891	8	16	Oct.	Oct. Mar.	7	r o o	y r s	t j	s	7	d m
58	Stark	1898	9	15	Jan.	Dec. May	10	r o b	y r s	t j	s	4 5	d m
59	Stuart	1894	9	19	Oct.	Dec. May	4	r o	y r	t j	s	5 6	d m
60	Stump	1890	9 10	16	e Aug.	Aug. Sept.	4 23	r o	w r	t j	s	7 8	d m
61	Summer Pearmain	1898	8 9	19	b Sept.	Sept.	5	r o	y r u	t j	s	10	d
62	Summer Rose	1892	9	18	b Aug.	Aug.	4	r o	y r s	t j	s	8	d
63	Thaler	1898	10	16	m Aug.	Sept.	5	r o	y r s	t j	s	6	d
64	Thornton	1892	8 9	14	Oct.	Nov.	4 5	r o	y r s	t j	s	4 5	d
65	Titovka	1898	7	14	m Aug.	Sept.	7	r o o	y r s	t j	s	5 6	d m
66	Talman	1898	9	19	e Oct.	Oct. Mar.	6	r o	y r	t j	s	8	k
67	Washington Strawberry	1890	8 9	18	b Sept.	Sept.	8	r o o	y r s	t j	s	7 8	d m
68	Water	1890	8 9	18	Oct.	Oct. Nov.	4 5	r o v	y r	t j	s	5	d m
69	Wealthy	1890	8	16	b Sept.	Sept. b Nov.	6	r o	y r s	t j	s	6	d m
70	Winter Streiffing	1898	10	14	b Sept.	Sept.	8	r o	y r s	t j	s	4 5	d m
71	Yellow Transparent	1898	9 10	17	b Aug.	Aug.	6 33	r o v	y	t j	s	3 4	d m
72	York Imperial	1892	9 10	19	Oct.	Nov. Feb.	4 5	r o	y r s	t j	s	5 6	d m
73	Zolotore	1890	8	16	e Aug.	Aug.	4 5	r	y r	t j	s	3 4	d m
74	Zuzoff	1890	9	13	b Sept.	Sept. Oct.	4	r o	y r	t j	s	3 4	d m

TABULATION OF CRAB APPLES, 1888.

*Pyrus baccata*; including actual and supposed hybrids.

ABBREVIATIONS—Month: b, beginning; e, end; m, middle. Form: c, conical; i, irregular; o, oblate; ob, oblong; ov, ovate; r, roundish. Color: g, green; r, red; ro, ru-seet; s, -striped; w, white; y, yellow. Texture: c, crisp; d, dry; f, firm; j, juicy; t, tender. Flavor: a, acid; m, mild; s, sweet. Use: c, cider; d, d ssert; k, kitchen; m, market.

No.	Names	Origin.	Planted.	Vigor.	Bloomed.	Ripe.	Season.	Weight in ounces.	Form.	Color.	Texture.	Flavor.	Quality—scale 1 to 10.	Use.
1	August.....	Minnesota.....	1880	8	May 12	Aug 12	m Sept.....	4	ro	yr	c	s	4	d m
2	Dartmouth.....	Massachusetts.....	1880	10	" 14	" 15	e Aug. b Sept.	1.5	o	yr	c	s	10	d m
3	Fitchester.....	Minnesota.....	1880	9	" 15	" 20	e Aug.....	1.5	o	yr	c	s	9	d m
4	Florence.....	Minnesota.....	1880	8	" 13	" 23	b Sept.....	2	o	yr	c	s	6.7	d m
5	Jelly.....	Minnesota.....	1880	10	" 13	e Sept.....	b Oct.....	2	o ob o	yr	c	s	8	d m
6	Lon.....	Minnesota.....	1880	9	" 13	m Aug.....	Sept.....	5	ro v	yr	o t j	s	4.8	d m
7	Martha.....	Minnesota.....	1880	7.8	" 14	m Aug.....	Sept. Oct.....	1.5	o	yr	c	s	9.10	d m
8	North Star.....	Minnesota.....	1880	7.8	" 11	m Aug.....	Sept.....	1.5	ro	yr	c	s	4.8	d m
9	No. 1 New.....	Minnesota.....	1880	9 10	" 19	m Aug.....	m Aug.....	9	ro b	yr	c	s	7.8	d m
10	No. 2 New.....	Minnesota.....	1880	9 10	" 11	m Sept.....	Sept.....	4.5	o c	yr s	t j	s	5	d m
11	October.....	Minnesota.....	1880	8	" 14	e Aug.....	Aug. Sept.....	4	o	yr	t j	s	5.6	d m
12	Park.....	Minnesota.....	1880	8.9	" 15	Sept 9	Sept.....	3	o c	yr	t j	s	5.8	d m
13	Walt.....	Minnesota.....	1880	10	" 10	Aug. 23	e Aug.....	3	ro b	yr	t j	s	8.9	d m
14	Whitney.....	Illinois.....	1880	10	" 10	Aug. 23	e Aug.....	3	ro b	yr	t j	s	8.9	d m

**Gideon.** One of the most valuable of the seedlings grown by Peter Gideon, of Minnesota. Tree quite vigorous with an upright, spreading, but rather slender growth. Fruit medium to large, roundish, slightly conical, with a deep, acute and uneven cavity; stalk one to one and three-fourths inches long, rather slender; basin narrow, shallow, much plaited, and with a small, closed calyx; calyx tube conical; color clear, light yellow, generally with a blush, and occasionally irregularly marked with patches of russet, with a few dark spots and many almost obscure light dots and specks; flesh white, firm, crisp and juicy, with a sub-acid and something of a crab-like flavor; core rather large, open; seeds many, large. Season fall and early winter. A promising variety for cooking purposes, especially in sections where hardness is necessary.

**Gill.** Tree vigorous with a roundish head. Fruit quite large, roundish, oblate, and slightly conical; cavity deep, abrupt, slightly irregular; stalk three-fourths inches long, moderately stout; basin medium, slightly corrugated; calyx of medium size, open, with short, erect segments; calyx tube funnel-shaped, small; flesh white, moderately juicy, firm, with a mild sub-acid flavor; color light greenish-yellow, with a dark red blush and indistinct stripes, much flecked with cinnamon russet, and with a sprinkling of light brown dots and specks, more frequent toward the cavity, which is much russeted; core medium, open; seeds plump, ovate. Season November to March. It promises to be a valuable market variety, if sufficiently productive.

**Gloeger.** Tree moderately vigorous, and of a roundish, upright form. Fruit ovate, inclined to oblong; cavity deep, acute; stalk one-half to three-fourths inches long, rather stout; basin narrow, ribbed, moderately deep; calyx partially open, segments upright, with tips recurved; calyx tube conical; color yellow, with much cinnamon in stripes and patches, especially towards the stem, and quite thickly sprinkled with brown dots; core rather large, closed; flesh white, crisp and juicy, moderately tender and with a mild, sub-acid flavor. Season December to March. Said to be very hardy in Wisconsin.

**Grosh.** Trees moderately vigorous, upright, spreading. Fruit large, roundish oblate, regular; cavity broad, moderately deep; stalk one-fourth inch long, fleshy; basin narrow, moderately deep, ribbed; calyx small, closed; calyx tube small, slightly funnel-shaped; color greenish-yellow, striped and splashed with red; flesh whitish, firm, crisp, moderately juicy, with a mild, sprightly, sub-acid flavor; core medium, open; seeds plump. Season September and October. An early and annual bearer, and if as the trees become older they prove productive, it seems to be a valuable variety either for dessert or cooking purposes.

**Haas.** A strong-growing, upright tree forming a beautiful and symmetrical head. Fruit large, oblate, slightly conical, angular or ribbed; cavity medium, a little greenish; stalk three-fourths inch long, small; basin small or medium, slightly corrugated; calyx small, closed; calyx tube funnel-shaped; color pale, greenish-yellow, shaded nearly over the whole surface with light and dark red and with rather obscure splashes and stripes, and a few light dots; flesh white, juicy, fine grain and tender; flavor brisk, sub-acid; core medium to large. Season September and October. A valuable market variety on account of its extreme hardness.

**Hagenkopt.** Tree very vigorous, spreading. Fruit roundish ovate; cavity small, moderately deep; stalk one-half inch long, stout; basin

shallow, much corrugated; calyx small, closed; calyx tube funnel-shaped; color yellow, slightly washed and broken in stripes with light red; flesh creamy white, very juicy, but with a firm texture; flavor vinous. Season September and October.

**Hubbardston.** Trees quite vigorous, forming a handsome, branching head. Fruit roundish, inclining to conical or ovate; cavity broad, deep, russeted; stalk five-eighths inch long, rather slender; basin narrow, rather abrupt, and irregularly corrugated; calyx open; calyx tube conical; color yellow, mostly overspread and indistinctly striped with red patches and with tracings of yellowish-russet and with russet dots and specks; core round, closed; flesh yellowish-white, juicy, firm, crisp and tender; flavor rich, mild, sub-acid. Season December to February. A very valuable variety either for market or home use. Although it seldom reaches so large a size, in 1897 a single specimen weighed fourteen and three-fourths ounces.

**Indian.** Tree quite vigorous and upright in habit. Fruit large, roundish oblate, conical; cavity narrow, deep; stalk three-fourths inch long, stout; basin narrow, shallow, corrugated; calyx nearly closed; calyx tube funnel-shaped; color yellow, striped and mottled with very dark red and russet, with numerous regular yellow dots and specks more frequent toward the eye; flesh creamy white, juicy, firm and crisp; flavor sub-acid. Season October to January. It seems to be a productive sort and may prove of some value for market purposes, although it is of rather low quality for home use.

**Iowa Keeper.** A very vigorous, upright growing tree. Fruit oblate, with a narrow, acute cavity, russeted about the stalk, which is slender and one-fourth of an inch long; basin medium, ribbed, knobbed or plaited; calyx closed or partially open; calyx tube large, funnel-shaped; color greenish-yellow, blushed with dark red and with many light specks; core small, nearly closed; seeds medium in number; flesh white or greenish-white near the surface, and with a very firm texture and moderately juicy; flavor mild and sub-acid. Season December to March.

**Jefferis.** Tree of moderate growth, roundish, spreading. Fruit of medium size, roundish oblate, conical, with a broad, deep and slightly russeted cavity; stalk medium, one-half inch long; basin abrupt, deep, smooth, regular; calyx medium, closed; calyx tube conical; color yellow, striped with dark, rich red; flesh crisp, tender, juicy, almost melting, with a mild, sub-acid, rich, excellent flavor. Season middle of September. Core small and compact. Its high quality makes it especially desirable for home planting or for local markets, but it is rather tender for long shipments.

**Jersey Sweet.** Tree vigorous with a roundish head. Fruit of medium size, roundish, conical, with a deep, narrow, irregular cavity; stalk one-half inch long; basin narrow, abrupt, irregular, corrugated; calyx closed; calyx tube very long, funnel-shaped; color two shades of red, striped with yellowish-green and with many greenish specks; core slightly open; seeds ovate, pointed; flesh yellowish-white, coarse, crisp and tender, but not very juicy; flavor sweet, rich. Season September to October. A valuable fall, sweet variety for dessert or culinary purposes.

**Jonathan.** Tree quite vigorous, of an upright habit, but with drooping branches; young shoots are slender, pendulous, greyish-brown. Fruit of medium size, roundish conical, with a rather deep cavity, sometimes

plaited and russeted; stalk one inch long, medium size; basin narrow, rather deep, plaited; calyx nearly or quite closed, segments erect; calyx tube nearly conical, slightly funnel-shaped; color clear, light yellow, nearly covered with bright red, shaded into rich, dark red, with frequent, conspicuous light yellow dots and specks; core closed; seeds few, ovate; flesh white, occasionally stained with red near the surface; flavor sprightly, vinous, sub-acid; texture crisp, tender, juicy. Season from November to February. A valuable variety for home use or market purposes, on account of its attractive appearance and high quality.

*Keswick Codlin.* Tree vigorous, upright, somewhat spreading. Fruit medium to large, inclined to ovate, ribbed at the apex; cavity rather broad, shallow, plaited; stalk one-half inch long, stout; basin shallow, narrow, much corrugated; calyx small, closed, with very long, partially reflexed segments; calyx tube conical; color greenish-yellow, or clear yellow when mature, brownish russet in the cavity; flesh white, crisp, juicy, with large open core; flavor acid. Season August and September. Seeds small, many of them abortive. An early and profuse bearer, so much so that unless carefully pruned and thinned, the trees are short-lived. Valuable for culinary purposes, from the fact that the fruit can be used for cooking purposes some weeks before it is ripe, and in this way the season can be extended for some months.

*Kirkland.* Tree vigorous. Fruit roundish oblate, occasionally oblate; cavity moderately deep, abrupt and regular; stalk three-fourth to one inch long; basin broad, shallow, corrugated; calyx medium, open; calyx tube short, funnel-shaped; color varying from clear, light yellow, nearly overspread with light cinnamon russet, to greenish-yellow, with very dark russet; flesh yellowish white, green next to the skin; texture crisp; flavor sprightly, sub-acid, pleasant. Season December to March. A promising variety for dessert or cooking purposes, if the trees prove sufficiently productive.

*Longfield.* A vigorous, spreading tree, with the young wood of a dark brown. Fruit of medium size, roundish conical, with a narrow, deep cavity; stalk three-fourths to one inch in length, slender; basin narrow, deep, abrupt, plaited; calyx large, closed, with rather long segments; calyx tube funnel-shaped; color pale yellow, with a pink, or brownish-red cheek, and a very few dark specks and netting of light crimson russet; core small, closed; seeds large, plump, ovate; flesh white, moderately juicy, crisp and tender, with a pleasant, sprightly, sub-acid flavor. Season October to November. A very handsome and quite productive variety that is promising on account of its extreme hardiness, as a culinary variety for home use or market purposes.

*Lou.* Tree vigorous, upright. Fruit medium to large, roundish, ovate, with a narrow, deep, regular cavity; stalk one-half inch long, stout; basin very irregular, narrow, shallow, corrugated; calyx large, closed; calyx tube roundish obtuse, conical; color yellow, with broken stripes of dark red upon golden brown in the sun; bloom light, whitish; core large, open; seeds many, ovate, plump; flesh yellowish-white, juicy, crisp, tender, sprightly, sub-acid. Season August to September. Young wood dark brown; foliage large, waved, downy. A hardy variety that may prove valuable for culinary and market purposes.

*Louise, Princess Louise.* A strong-growing, upright tree. Fruit of medium size, roundish oblate, with a medium-sized, acute cavity; stalk

three-fourths inch long, rather slender; basin broad, rather shallow, corrugated; calyx nearly closed, segments reflexed; basin deep funnel-shaped; color greenish-white, with a deep reddish-brown blush and nearly obscure greenish dots and specks; flesh white, very tender and crisp, but not very juicy; flavor aromatic, mild, very pleasant. Season November to January. A promising variety for home use as a dessert fruit, and if it proves productive, likely to become a valuable market variety.

**Magog.** A vigorous-growing, upright tree. Fruit roundish, occasionally remotely ovate, with a broad, deep and irregularly plaited cavity; stalk one inch long, medium; basin varying from medium to broad, moderately deep and abrupt, corrugated; calyx small, closed; calyx tube long-conical, or funnel-shaped; color light yellow, shaded and faintly striped and splashed with light red over one-half the fruit; flesh creamy white, tender, not very juicy; flavor sub-acid, not pleasant. Season November to February. Although of rather poor quality, its extreme hardness may make it a valuable variety for the northern portion of the state.

**Loy.** Tree moderately vigorous, upright. Fruit large, oblate, regular, with a moderately deep, russeted cavity; stalk three-fourths inch long, slender; basin medium, plaited; cavity medium, open, segments reflexed; calyx tube long, cylindrical; color greenish-yellow, nearly covered with a dark, rich red and with obscure stripes and numerous dots and irregular specks; core medium, closed; seeds plump, ovate; flesh whitish, juicy, plump and crisp; flavor mild, acid. Not sufficiently tested to determine its productiveness, but if not lacking in this respect, it may prove a valuable variety for market purposes. Season November to February.

**Mariscalade.** Tree moderately vigorous, spreading. Fruit medium size, roundish oblate, irregular; cavity deep, regular, plaited; stalk one-half to three-fourths inch long, stout; basin deep, abrupt; calyx large, slightly open, segments large, reflexed; calyx tube conical; color yellow, marbled and striped with two shades of red; core large, open; seeds ovate, plump; flesh creamy white, not very juicy, sweet; texture rather coarse, crisp. An early bearer and quite productive variety that may be valuable for home use. Season September to October.

**Martha.** Tree rather vigorous and of an upright growth while young. Fruit rather large for a crab, oblate, with a broad, russeted cavity; stalk one inch long, slender; basin shallow, broad; calyx open, segments long, fully reflexed; calyx tube funnel-shaped; color yellow, nearly or quite overspread with bright red, with many yellowish specks and a thin pinkish bloom; flesh pale yellowish white, with a high, sprightly flavor; texture crisp, breaking, tender; quality quite good.

**Mason Orange.** Tree quite vigorous and rather spreading. Fruit roundish oblate, ribbed; cavity broad, deep, irregular, with a little grayish russet; stalk one inch long; basin narrow, shallow, much corrugated; calyx small, nearly closed; calyx tube slightly funnel-shaped; color yellow at maturity, with a faint pinkish brown cheek and a few grayish dots and specks; flesh yellowish white, juicy, crisp, tender, sub-acid; quality fair. Season November to January; size large. Young wood yellowish brown, foliage nearly flat, oval, pointed; core large, open; seeds ovate, plump.

**McIntosh.** Tree rather vigorous, with a spreading head. Fruit roundish oblate, regular; cavity medium; stalk rather small; basin medium,

rather shallow, slightly ribbed; calyx small, nearly closed, segments erect; calyx tube long, funnel-shaped; color whitish yellow, nearly covered with dark, rich red or crimson, almost purplish in the sun, and moderately sprinkled with light dots; flesh white, fine grained, juicy, very tender; flavor mild, sub-acid, refreshing, peculiar; core medium, open; seeds plump, ovate; season November to February; size medium; quality quite good. A hardy and generally productive variety, promising for dessert and market purposes.

**Munson.** Tree rather vigorous, spreading. Fruit oblate, cavity large, deep, regular; stalk rather short, medium size; basin small to medium, shallow, corrugated; calyx closed, segments long, reflexed; calyx tube tubular; color pale yellow, sometimes blushed with many almost obscure whitish specks; flesh yellowish, juicy, crisp, tender, sweet; quality fair. Season October; size medium.

**Nero.** Rather strong with a spreading head. Fruit roundish oblate; cavity narrow, deep, regular, russeted; stalk one-half inch long, medium; basin very broad, saucer-shaped, ribbed; calyx large, open, segments long; calyx tube short, funnel-shaped; color clear yellow, nearly covered with dull red, deepening into dark red, with patches and marblings of russet, sprinkled with a few large, roundish dots, with grayish centers; flesh whitish, juicy, firm, crisp, with a mild, sub-acid, slightly aromatic flavor; quality good. Season January to April; size large.

**No. 1 New.** A seedling from Peter Gideon of Minnesota. Tree quite vigorous, with a roundish head. Fruit roundish, inclining to oblong; cavity narrow, abrupt, russeted, corrugated; stalk one-half inch long, stout; basin medium, corrugated, deep; calyx small, closed; calyx tube conical; color grayish yellow, beautifully spotted and stained with two shades of bright red, with numerous grayish dots and specks; flesh white, not very juicy, rather coarse, crisp, tender, with a sprightly, sub-acid, pleasant flavor; quality quite good. Season September; size large. Its size, handsome appearance and quality make it a promising variety for either home use or market.

**No. 2 New.** A seedling from Peter Gideon. Tree quite vigorous, upright, spreading; young wood olive-colored. Fruit oblong, conical; cavity broad, deep, with a few rays of grayish russet; stalk one to one and one-fourth inches long, slender; basin rather broad, shallow, plaited; calyx large, closed, segments erect or occasionally reflexed; calyx tube short, conical; color greenish yellow, partially washed and faintly striped with bright red and with many whitish specks; core medium, open; seeds many, ovate, plump; flesh white, very tender, moderately juicy, and with a high sub-acid flavor; quality fair to good. Season September; size medium to large. An early bearing and fairly productive variety, which has some promise as a culinary fruit.

**Northfield.** Tree rather vigorous, with a roundish head. Fruit roundish oblate, sides unequal; cavity broad, moderately deep, slightly russeted; stalk one inch long, rather stout; basin wide, abrupt, moderately deep, corrugated; calyx medium, nearly closed; calyx tube long, funnel-shaped; color whitish-yellow, blushed and faintly striped with red and netted more or less with russet; flesh juicy, crisp, tender, mild, sub-acid; core medium, closed; quality rather poor; size large. Season September to December.



North Star (Crab.) Tree upright, spreading. Fruit roundish oblate; cavity of moderate size, regular, corrugated, russeted; stalk one-half inch long, medium, inclined; basin shallow, corrugated; calyx medium, closed; calyx tube cylindrical; color pale yellow, nearly overspread with bright red in the sun and with many yellowish specks; flesh creamy white, tender, breaking, sub-acid. Season August; size rather small; quality fair.

Oakland. Tree fairly vigorous, with slender, spreading branches; young wood dark brown. Fruit oblate, nearly regular; cavity broad, moderately deep, with a little dark gray russet; stalk medium size, one-half inch long; basin rather broad, deep, slightly plaited; calyx closed; calyx tube nearly tubular; color yellow, nearly covered with pale red, distinctly striped and splashed with darker red; flesh white, juicy, fine grained, very tender, mild, sub-acid, with a rich, pleasant flavor. Season November to February; quality quite good; size medium to large.

October (Crab.) Tree fairly strong, spreading. Fruit nearly round, tapering slightly to the eye; cavity rather narrow, deep; stalk rather stout, seven-eighths inches long; basin small, irregular; plaited; calyx large, closed; segments long, erect or slightly reflexed; calyx tube large, long, funnel-shaped; color bright red, with a few obscure stripes, pale yellow when grown in the shade; flesh white, crisp, tender, juicy, sharp, sub-acid. Season August and September; size medium to large for a crab. A promising variety if it proves sufficiently productive.

Oldenburg, *Duchess*. Tree fairly vigorous, rather upright, but with slender, drooping branches; young wood dark reddish brown. Fruit oblate; cavity broad, deep; stalk one-half inch long, stout; basin deep, slightly corrugated; calyx closed; calyx tube funnel-shaped; color pale yellow, washed and distinctly striped and splashed with light and dark red; flesh white, juicy, crisp, but a little coarse, acid; core closed; quality good. Season August and September; size large. A hardy and generally very productive tree.

Ontario. A strong growing, upright tree with spreading branches. Fruit oblate, slightly conical and frequently angular; cavity broad, deep, irregular, slightly russeted; stalk three-fourths to one inch long, stout; basin broad, deep, slightly corrugated; calyx small, closed or nearly so; calyx tube funnel-shaped; color whitish yellow, with a red cheek, and a few whitish dots and specks; flesh whitish, juicy, tender, brisk, sub-acid; core small, closed; seeds many, large, ovate. Season January to March; size large; quality good; quite productive. A promising variety, particularly for home use.

Peter. Tree quite vigorous, upright with spreading branches; young wood stout, reddish brown. Fruit oblate, inclining to conic; cavity broad, deep, sometimes with much cinnamon russet; stalk one inch long, rather slender; basin deep, abrupt, slightly plaited; calyx small nearly closed; calyx tube slightly funnel-shaped; color dark red, yellow in the shade, surface covered with a few light-yellowish specks, more numerous towards the crown; fles white, tender, juicy, with a sprightly, pleasant, sub-acid flavor; core medium, closed; seeds few, large, ovate, pointed. Season October; size large; quality good; generally quite productive. This appears to be a hardy and productive variety, and promising either for market or home use.

Quaker (Crab.) Quite vigorous, tree spreading with a round head. Fruit roundish, slightly ovate; cavity narrow, deep; stalk slender, rather

long; basin narrow, deep, plaited; calyx closed, segments rather long with tips slightly reflexed; calyx tube conical; color yellow with a brownish red blush where exposed and with a few indistinct whitish specks; flesh white, moderately juicy, fine grained, crisp, mild, sub-acid; seeds few, small. Season October to November; quality good; size medium.

**Quince, Cole.** Tree quite vigorous, very upright. Fruit roundish remotely conical, slightly ribbed; cavity broad, with rays of brownish russet; stalk one-half inch long medium size; basin narrow, ribbed; calyx closed; calyx tube conical; color yellow, with a few dark specks; flesh whitish, juicy, crisp, tender, sharp, sub-acid; core medium, closed; seeds few, plump. Season August and September; quality medium; size medium to large. A valuable variety for cooking purposes.

**Red Aport.** Tree quite vigorous with an upright growth and spreading branches. Fruit oblate, conical, regular; cavity broad, deep, with light gray russet; stalk quite long and very stout; basin narrow, deep, abrupt, plaited; calyx open, segments upright, tips reflexed; calyx tube long, conical; color yellow, washed and obscurely striped with two shades of red, with russet dots and rays of russet extending from the cavity; young wood dark grayish brown; foliage cupped; flesh white, juicy, crisp, a little coarse, sub-acid. Season October and November; quality good; size quite large.

**Rosenhager.** Tree quite vigorous, with a roundish head. Fruit round, regular, slightly oblate-conical; cavity narrow, deep, with faint whitish-gray russet; stalk three-fourths inches long, of medium size; basin broad, rather deep, corrugated; calyx large, nearly closed; calyx tube long, funnel-shaped, remotely tubular; color green or yellow when matured, with dark brownish red cheek, overspread, or faintly striped, with dark red, with numerous light gray spots and specks; flesh greenish white, juicy, crisp, rather tender, with an acid flavor; core open with large, long, pointed seeds; quality medium. Season October to November; size quite large.

**Scarlet Cranberry.** Tree rather vigorous, spreading. Fruit oblate; cavity deep, regular; stalk short and slender; basin broad, shallow, corrugated; calyx small, open, with erect segments; calyx tube broad, funnel-shaped; color greenish yellow, washed and remotely striped with dull, dark red, and nearly overspread with greenish irregular dots and specks; flesh whitish, slightly veined, firm and juicy, with a slightly sub-acid flavor; quality fair. Season December to February; size medium to large.

**Sheriff.** Tree quite strong with spreading branches. Fruit roundish, inclining to oblong, conical; cavity narrow, rather deep; stalk one inch long, rather slender; basin narrow, shallow, plaited; calyx closed or partly open; calyx tube funnel-shaped; color greenish, nearly overspread and faintly striped with dark red, sprinkled with small, light specks; flesh white, moderately juicy, fine-grained, tender, with a mild sub-acid flavor; core medium, closed; quality good; size medium to large. Season October to February. A handsome apple of good quality that is likely to prove valuable if sufficiently productive.

**Somerset, New York.** Tree rather strong, upright. Fruit conical, slightly ribbed; cavity broad with dense cinnamon russet; stalk seven-eighths of an inch long; medium size; basin small, slightly plaited; calyx large, open; calyx tube conical; color yellow, netted and spotted with grayish russet; flesh yellowish-white, moderately juicy, tender, very

sprightly and of quite high flavor. Season August to September; size medium. An early bearer and a valuable variety for eating purposes.

**Stark.** Tree very strong, with a roundish head, and spreading branches. Fruit roundish, oblong, conical; cavity broad, narrow; stalk three-fourths inches long, stout; basin narrow, much plaited; calyx closed, tips pointed, segments erect, reflexed; calyx tube the frustum of a cone; color greenish-yellow, striped and splashed with light and dark red, with more or less cinnamon russet; flesh pale yellowish white, juicy, firm and crisp, mild, sub-acid; core large, nearly closed; seeds few, obovate; quality good. Season December to May; size large. Generally an early-bearing, productive variety, valuable on account of its keeping qualities.

**Stuart, Golden.** Tree quite strong, spreading. Fruit round, oblate, corrugated; cavity deep, acute, russet; stalk one-half to one inch in length; basin rather deep and broad, corrugated; calyx nearly or quite closed, segments erect; calyx tube conical; color greenish-yellow with a brownish-red blush in the sun, moderately sprinkled with brownish dots and specks which nearly overspread the whole surface; flesh white, rather juicy, crisp, tender, sprightly, acid; quality good. Season November to January; size medium.

**Stump.** Tree with a symmetrical, roundish, conical head. Fruit roundish, conical, inclining to oblong conical, sometimes with sides a little unequal; cavity medium, often russeted; stalk three-eighths inches long, rather small; basin a little above medium, slightly plaited; calyx small, closed or partially open; calyx tube conical; color white, shaded with bright red, and moderately striped and splashed with crimson over most of the surface, with a few large and small light dots; skin smooth; flesh white, juicy; fine grain, tender, with a pleasant, sub-acid flavor; core rather large, open. Season September and October; quality good; size medium.

**Summer Pearmain, American.** Tree fairly strong with an upright habit, young wood, slender, reddish brown. Fruit oblong, slightly conical; cavity deep with a little cinnamon russet; stalk one inch long, medium size; basin rather broad, deep, regular; calyx nearly closed, segments erect with tips recurved; calyx tube long, funnel shaped; color red, streaked with bright red and yellow in the sun, with many yellowish dots and more or less russet; flesh whitish, juicy, very tender, mild, sub-acid, very rich; quality excellent. Season September; size medium. Both foliage and fruit are somewhat subject to the attack of the apple scab fungus, unless sprayed. When well grown it is one of the best summer varieties for dessert purposes.

**Summer Rose.** Tree quite strong with spreading branches, young wood grayish brown, with many light-gray or white dots. Fruit oblong; cavity broad, moderately deep, slightly corrugated; stalk one inch long, rather stout; basin broad, uneven, rather deep; calyx large, slightly open, segments somewhat recurved; calyx tube conical; color red, blushed and striped upon a yellowish white ground; flesh white, tender and juicy, with a brisk sub-acid flavor; core closed, seeds few. Season August; quality good; size medium.

**Thornton.** Tree quite vigorous, upright; young wood dark brown. Fruit roundish; cavity deep with dense gray russet; stalk five-eighths of an inch long; basin abrupt, slightly plaited; calyx closed or slightly open;

calyx tube obtuse, conical; color greenish-yellow, washed and striped with dark red, netted with rough, dark red russet; flesh white, moderately juicy, firm, crisp, sub-acid. Season November to February; quality fair to good; size medium. An early bearer.

**Titovka.** Tree very vigorous with an upright habit, but with branches much spreading. Fruit oblong, slightly conical, irregular; cavity very deep, irregular; basin quite irregular, ribbed, deep; stalk one-half inch long, stout; calyx large, nearly closed; calyx tube funnel-shaped; color greenish-yellow, often nearly covered with dark red, striped with darker red; flesh white, juicy, crisp, sub-acid; core medium, nearly closed; seeds medium, ovate, plump. Season September; quality good; size large. An early and productive bearer, valuable either for home use or market purposes.

**Water.** Tree fairly vigorous with upright habit; young wood dark brownish-black. Fruit roundish or ovate to roundish conical; cavity medium with a faint grayish-brown russet; stalk three-fourths of an inch long, rather slender; basin small to medium, abrupt, corrugated; calyx closed; calyx tube conical; color yellowish white, shaded with purplish crimson in the sun, with a few brown dots and specks; flesh white, juicy, tender, sprightly, sub-acid, pleasant; quality good. Season October to November; size medium to large. Thus far only fairly productive.

**Washington Strawberry.** Tree quite vigorous, rather spreading; young wood, stout, dark brown; foliage dense. Fruit oblong, conical; cavity narrow, deep; stalk three-fourths to one inch long, medium to large; basin rather narrow and abrupt, corrugated; calyx medium, nearly closed; calyx tube funnel-shaped; color yellow, mostly overspread with stripes of bright red, with a little brownish russet in the cavity; surface covered with light dots. Season September to October; quality good; size large. A generally productive and valuable variety for home and market use.

**Wealthy.** Tree vigorous, with a roundish head and spreading, slender branches. Fruit roundish, oblate, slightly conical; cavity broad, acute, russet; stalk three-fourths of an inch long, slender; basin narrow, abrupt, uneven; calyx closed; segments long, tips reflexed; calyx tube long, funnel-shaped; color pale yellow, mostly overspread with dark red, obscurely striped; dots large, light; flesh white, juicy, firm, sub-acid; core closed, seeds few, quality good; season October to December; size large. An early bearer and generally quite productive. One of the most promising of the new fall sorts. Tree very hardy.

**Whitney, 20.** Tree quite vigorous, with an upright habit. Fruit ovate, conical; cavity narrow; stalk one inch long, rather stout; basin medium, plaited; calyx closed; calyx tube long, funnel-shaped; color dark red on yellowish ground; surface of fruit covered with specks, spots and flecks of yellow; flesh pale yellow, juicy, crisp, mild, sprightly, sub-acid. Season August and September; quality good; size large for a crab. One of the hardiest and best of the crabs.

**Winter Streifling.** Tree quite vigorous with a roundish head and spreading branches. Fruit roundish, slightly oblate; cavity, broad, deep, slightly russet; stalk one inch long, rather slender; color whitish yellow, striped and splashed with dark red; basin medium size, plaited or ribbed; calyx large, closed; tips reflexed; calyx tube large, long, conical; flesh yellowish-white, moderately juicy, rather coarse, tender, brisk, sub-acid;

core medium, compact; seed large, plump; quality medium; size large; quite productive. Season October to November. Well worthy of trial in the Northern part of the State, where it would probably be an early winter sort.

**Yellow Transparent.** Tree quite vigorous, with an upright form; young shoots, dark olive. Fruit roundish, remotely conical; cavity broad, deep, irregular; stalk seven-eighths of an inch long, stout; basin shallow, corrugated; calyx nearly closed; calyx tube conical; color light yellow, with numerous light brown spots; flesh white, juicy, a little coarse, tender, acid; core medium, open; seeds many; quality fair; size medium to large. Season August. A valuable early variety.

**York Imperial.** Tree quite vigorous with an upright habit, but with spreading branches. Fruit oblate, somewhat oblique; cavity, broad, deep, russeted; stalk three-fourths of an inch long, stout; basin broad, deep, slightly corrugated; calyx small, closed, or partially open; calyx tube funnel-shaped; color light yellow, shaded with crimson in the sun, with numerous large, light gray specks; flesh yellowish white, sprightly, sub-acid. Season November to February; quality good; size large. A valuable sort for home use or market purposes.

**Zolotoreff.** Tree fairly vigorous, with spreading habit. Fruit round with a rough surface; cavity narrow, rather deep, corrugated; calyx open; calyx tube broadly conical; color pale yellow, shaded, striped and splashed with light and dark red; flesh white and moderately juicy, inclined to become rather coarse; firm, crisp, mild, sub-acid. Season August to September; quality fair; size large. Fairly productive.

**Zuzoff.** Tree quite vigorous, with a roundish head. Fruit rounded, conical; cavity narrow, rather deep, irregular; stalk one inch long, moderately stout; basin narrow, plaited; calyx medium sized, closed, segments stout, reflexed; calyx tube conical or slightly funnel-shaped; color pale yellow, nearly covered with two shades of red, with many yellowish specks, and with a slight whitish bloom; flesh white, moderately juicy, tender, brisk, mild, vinous. Season September to October; size medium to large; quality rather poor. Seems to have little value unless for the cooler parts of the State.

## CHERRIES.

Aside from a few varieties, planted from year to year, most of the cherry trees were set in 1890 and 1891 and have developed sufficiently to indicate their probable value. During the season of 1898, however, comparatively few varieties gave a full crop, and hence it is not possible to judge of the relative productiveness of the kinds. The trees were sprayed with a strong solution of copper sulphate previous to the opening of the buds, and, as soon as the fruit had set, were again thoroughly sprayed with Bordeaux mixture and Paris green, the latter being used at the rate of three ounces to forty gallons. On the fifteenth of June, the black aphid having appeared on a few of the trees, they were sprayed with tobacco water, and the application was repeated upon the twenty-third of June and the third of July, on such trees as required it. Although it had been quite troublesome in previous years, the presence of the cherry slug was not observed at any time during the season.

TABULATION OF CHERRIES, 1898.

Name.	Species.	Planted.	Bloomed.	Ripened.	Weight of berry in ounces.	Productiveness— scale 1 to 10.	Quality—scale 1 to 10.	Vigor—scale 1 to 10.
Abbees	Morello.	1888	May 4	7 2	2-17	4 5	4 5	8 9
Angouleme	Duke	1888	" 6	7 3	2-12	2	7 8	10
Badaconyi	Avium	1884	April 3	7 5	2-9	3	5 6	8
Basendor	Morello.	1892	May 9					9 10
Baltavari	Avium	1894	" 1	7 2	2-14	1 2	7 8	
Bessarabian	Morello.	1888	" 4	7 7	2-10	3 4	5	10
Brusseler Braune	Morello.	1893	" 9	7 18	2-14	3 4	5 6	10
Carnation	Duke	1891	" 4	8 23	2-10	9 10	7 8	8 9
Centennial	Avium	1898	" 2	7 9	2-8	1	6 7	7
Choisy	Duke	1898	" 2	6 22	2-14	1	10	19
Cleveland	Avium	1888	" 2	6 23	2-10	8 9	6 7	10
Coe	Avium	1898	" 2	6 18	2-8	2 3	10	9 10
Downer	Avium	1888	" 2	6 30	2-10	2 3	8 9	9
Dwarf Rocky Mountain	Bessayi	1884	" 16					8 9
Dyehouse	Morello.	1891	" 6	6 21	2-10	10	5 6	8 9
Eagle (Black)	Avium	1888	" 2	6 21	2-10	5 6	10	8 9
Early Purple	Avium	1892	" 1	6 11	2-12	8	7 8	9 10
Eiton	Avium	1892	" 2	6 23	2-0	6 6	8 9	9 10
Espere	Morello.	1892	" 6	6 28	2-10	2 5	5 6	9 10
Eugenie	Duke	1888	" 2	6 17	2-10	6 7	7 8	7 8
Everbearing	Duke	1892	" 7	6 24	2-12	8 9	5 6	8
Florence	Avium	1892	" 6					7 8
Frauentorfer Weichsel	Morello.	1888	" 4	6 30	2-10	2 3	6 7	9 10
Galopin	Morello.	1891	" 8					7 8
George Glass	Morello.	1888	" 10	7 11	2-10	1	5 6	10
German	Avium	1894	April 29	7 6	2-14	3 4	2 14	9 10
Griotte du Nord	Morello.	1888	May 9	7 13	2-15	1 2	6 7	10
Hortense	Duke	1888	" 6	7 2	2-10	1	7 8	7 8
Ida	Avium	1893	" 1		2-8	8 9	8 9	9 10
King Amarella	Morello.	1891	" 9	6 24	2-30	7 8	6 7	9 10
Knight Early	Avium	1891	" 4	6 24	2-20	3 4	9	9 10
La Maurie	Avium	1893	" 2					9 10
Lancaster	Morello.	1894	" 6	6 25	2-16	1	5 6	10
Late Duke	Duke	1890	" 8	7 2	2-10	1	6 7	9 10
Lithauer Weichsel	Morello.	1893	" 9	7 7	2-20	8 9	4 5	9 10
Lutovka	Morello.	1888	" 9	7 29	2-10	3 3	5 6	9 10
Magnifique	Duke	1888	" 12	7 13	2-12	9 10	8 9	8
Mahaleb	Mahaleb	1893	" 13					8 9
Mary Kirtland	Avium	1891	" 2	6 21	2-10	9 10	6 7	6 8
Mastodon (Black)	Avium	1893	" 1					8
May Duke	Duke	1888	" 6	6 20	2-10	8 9	7 8	8 9
Messel	Avium	1891	" 1	6 24	2-12	4 5	8 9	8 9
Minnesota (Osthelm)	Morello.	1892	" 8	6 30	2-14	5	6 7	9 10
Modryansky	Avium	1894	" 2	7 5	2-10	1 2	5	9 10
Montmorency	Morello.	1888	" 9	6 21	2-12	5 6	5 6	8
Montmorency Ordinaire	Morello.	1891	" 9	7 2	2-10	10	5 6	10
Montrouil	Duke	1890	" 8	7 1	2-12	9 10	4 5	9 10
Napoleon	Avium	1892	" 2	7 5	2-6	8 9	5 6	8 9
Northwest	Morello.	1893	" 13	7 5	2-22	10	4 5	8
Ohio (Beauty)	Avium	1891	" 3	6 21	2-13	8 9	6 7	8 9
Olivet	Duke	1891	" 7	6 25	2-10	2 3	6 7	10
Orel 25	Morello.	1893	" 9	7 13	2-13	2 13	4 5	9 10
Orel 27	Morello.	1893	" 11	7 28	2-14	1 2	4 5	10
Osthelm	Morello.	1891	" 7	6 29	2-14	3 4	5 6	9
Osthelm	Morello.	1893	" 13	6 29	2-10	7 8	4 5	10
Philippe (Louis)	Morello.	1888	" 8	6 22	2-10	2 3	7 8	9 10
Plymouth Rock	Avium	1890	" 13	7 28	2-10	1	7 8	8
Parity	Avium	1893	" 7					
Richmond	Morello.	1893	" 8	6 21	2-12	8 9	4 5	9 10
Rockport	Avium	1891	" 3	6 20	2-10	6 7	8 9	10

Tabulation of Cherries—CONCLUDED.

Name.	Species.	Planted.	Bloomed.	Ripened.	Weight of berry in ounces.	Productiveness— scale 1 to 10.	Quality—scale 1 to 10.	Vigor—scale 1 to 10.
Royal Duke	Duke	1891	May 8	6 17	2-15	4 5	7 8	6 7
Rocky Mt. Dwarf	Bessy	1894	" 16					8 9
Hupp	Duke	1894	" 9					9 10
Schmidt	Avium	1894	" 6					9 10
Sebrel	Avium	1896	" 14					8
Skianka	Morello	1898	" 9	6 21	2-16	8 4	5 6	7
Spanish (Yellow)	Avium	1891	" 2	6 30	2-10	9 10	10	8 9
Spate Amarella	Morello	1896	" 11	7 2	2-10	5 6	6 7	8
Strasse Walchael	Morello	1898	" 6	6 28	2-12	1	5 6	10
Suda	Morello	1898	" 13	7 7	2-15	10	4 5	9
Tartarian (Black)	Avium	1898	" 2	6 18	2-10	4 5	10	10
Ustis (Cal. Adv.)	Avium	1898	April 30					10
Weir 2	Morello	1898	May 9	6 22	2-10	10	6 7	9 10
White (Bigarreau)	Avium	1896						8 9
Windsor	Avium	1891	" 2	6 29	2-10	9 10	6 7	8 9
Wood (Gov.)	Avium	1891	" 2	6 21	2-12	10	5 6	9
Wragg	Morello	1893	" 11	7 4	2-14	8 9	4 5	8 9

Although not very productive, several of the varieties of cherries, including a number imported by Prof. Budd, from Russia, were in fruit the past season. The following have been most thoroughly tested:

#### MORELLO.

**Abbesse.** Tree spreading in growth, with slender and somewhat drooping branches; fruit quite small, of an irregular, globular form; stalk one and one-half inches long, quite slender and set in a very shallow cavity; color very dark purple, nearly black, with many minute, light specks; flavor quite acid and very astringent; flesh very dark with red juice; moderately tender; a tardy bearer and slow growing tree; not likely to be of value; ripe July 2.

**Bessarabian.** Tree of an upright habit with spreading branches; quite strong and vigorous; ripe July 7; fruit of medium size, roundish, slightly compressed; stalk one and one-half to two inches in length, moderately stout, set in a medium sized cavity; color dark crimson; flavor vinous, acid; flesh tender and with red juice. It has thus far shown itself to be only moderately productive.

**Brusseler Braune.** A Morello variety with a very strong, upright growth, but with branches somewhat drooping; ripe July 18; fruit very large, roundish, inclining to heart shape; stalk quite long, two to two and one-half inches, stout; in a small open cavity; color very dark crimson, becoming a rich, brownish black; flavor rich and acid; flesh tender, juicy, red; juice dark. The most promising of the Russian varieties that have thus far fruited. It ripens at about the same time as the English Morello, which it exceeds in size, and as the trees are stronger growers, it may in time take the place of that well-known sort.

**Dyehouse.** Tree of moderate growth, rather slender and of a spreading habit. Ripe June 26; fruit of medium size, roundish, slightly oblate; stalk one inch long, set in a rather broad cavity; color pale red; flesh tender; juice acid, light-colored. One of the earliest of the sour cherries, which has this year been among the most productive.

**Esperen.** Tree quite vigorous, roundish with spreading branches. Fruit large, roundish oblate, compressed; stalk one inch long, stout, set in a broad, deep cavity; color dark scarlet; flesh tender, juicy, quite acid. Season the last of June. A promising variety for market and cooking purposes, if it proves productive.

**Frauentorfer Weichsel.** Tree very vigorous, of a spreading or partially upright habit, with drooping branches. Ripe July 12; fruit large, heart-shaped, roundish, slightly compressed; stalk two inches long, moderately strong; cavity medium; color very dark, bright crimson; flesh tender with a vinous flavor; juice crimson; quality good; a valuable variety for home use or market and one of the best for cooking purposes.

**George Glass.** Tree very vigorous with a spreading top. Ripe July 12; fruit large, ovate; stalk one and three-fourths inches long, stout, set in a rather deep cavity; color dark crimson; flesh tender, light colored, with a vinous flavor; juice colorless. Has thus far proved unproductive.

**Griotte du Nord.** Tree quite vigorous, upright, spreading. Fruit of medium size, roundish, inclined to heart shape; stalk one and one-half to one and three-fourths inches long, very stout, set in a shallow, small cavity; color dark crimson, nearly black at maturity; flesh tender; flesh and juice dark; highly acid, rich; quality good; ripe July 15. Thus far unproductive.

**King Amarelle.** Tree quite vigorous, very spreading. Fruit medium size; ripe June 25; roundish, slightly oblate; stalk one and one-half inches long, rather slender, set in a broad, shallow cavity; color dark scarlet; flesh moderately tender, juicy, mild, acid; quality good. A productive and probably valuable sour cherry for market purposes.

**Lancaster.** Tree very vigorous, spreading. Fruit medium size, ripe June 25, roundish; stalk one and one-half inches long, moderately stout, set in a wide cavity; color bright, dark scarlet; flesh tender, very juicy; juice colorless; flavor vinous, sprightly; quality good. Rather small and as yet, quite unproductive.

**Lithauer Weichsel.** Tree quite vigorous, with a spreading head, and slender, drooping branches; ripe July 8; fruit rather small, globular; stalk two inches long, very strong; color very dark crimson, nearly black at maturity; flavor very acid, astringent; flesh tender, flesh and juice very dark crimson; quality poor. A hardy, productive variety, but not likely to be valuable.

**Lutovka.** Tree very vigorous, spreading. Fruit medium to large, ripe July 8, roundish oblate, with suture one-half around; stalk about one and five-eighths inches long, variable, stout, set in a rather wide cavity; color dark scarlet; flesh tender, moderately juicy, vinous; flesh and juice light-colored; quality good. A hardy variety and one likely to prove valuable for market if the trees prove productive.

**Minnesota.** Tree quite vigorous, with a round, spreading head. Fruit ripe June 30, medium size, roundish, heart-shaped, slightly compressed; stalk one and one-half to one and three-fourths inches long, set in a medium cavity; stem strong; color very dark crimson, almost black; flesh



tender, sub-acid, rich; flesh and juice very dark crimson; quality good. A promising variety in sections where hardiness is necessary.

**Montmorency.** Tree moderately strong, with a round, spreading head. Fruit ripe June 21, large, roundish oblate; cavity broad and deep; stalk one inch long, stout; color reddish amber; flesh tender, acid; juice pale; quality good. One of the most valuable of the Morello cherries for home use or market.

**Montmorency Ordinaire.** Tree quite vigorous, roundish, upright. Fruit ripe July 2, large, roundish; stalk one to one-half inches long, stout, set in a medium cavity; color crimson; flesh tender, vinous, sprightly, pleasant. Quite productive. The trees received under this name seem rather more productive and fully as desirable as those grown as Montmorency.

**North West.** Tree vigorous, spreading. Fruit small, ripe July 5, globular; stalk one and one-fourth to one and one-half inches long, quite slender, set in a small cavity; color red; flesh tender, brisk, acid, astringent; flesh and juice crimson; quality rather poor. Although quite productive, it does not seem to be of value.

**Orel 25.** Tree vigorous, upright, spreading. Fruit ripe July 13; medium to large, oblate, compressed; stalk one and one-fourth to one and one-half inches long, quite strong; cavity rather deep; flesh tender, acid, slightly bitter; flesh and juice light-colored; quality rather poor. Lacking in productiveness and apparently of no value.

**Orel 27.** Tree strong growing, upright, slightly spreading. Ripe July 28; fruit medium size, roundish, heart-shaped; stalk one and one-half to two inches long, very stout; color dark crimson at maturity; flesh tender, vinous, astringent; flesh and juice reddish; quality rather poor; not likely to prove valuable.

**Ostheim.** Tree quite vigorous with a spherical head; branches upright, with drooping twigs. Fruit small, roundish; stalk one and one-half inches long, medium size, in a shallow cavity; color dark red at maturity; flesh tender, very dark crimson; juice dark red; flavor rich, sub-acid. Season June 30. A very productive variety that is promising as a cherry for cooking purposes, in sections where hardiness is required.

**Ostheimer.** Tree quite vigorous, spreading. Fruit medium size, roundish, heart-shaped; stalk one and one-fourth to one and three-fourths inches long, slender, set in a medium cavity; color dark red, almost black at maturity; flesh tender, juicy, crimson; juice dark red; flavor acid, astringent; of rather poor quality, but a hardy and productive variety.

**Philippe (Louis).** Tree very vigorous, somewhat spreading. Fruit roundish, oblate; stalk one and one-fourth inches long, stout, set in a moderately deep cavity; color dark red, nearly black when fully ripe; flesh rather firm, moderately juicy and very acid; quality good. Season June 23. The tree seems to lack productiveness, but otherwise it appears to be a valuable sort.

**Richmond.** Tree quite vigorous, with slender, spreading branches. Fruit medium to large, roundish, heart-shaped; stalk one and three-eighths inches long, set in a moderately deep cavity; color very dark scarlet; flesh rather soft, juicy, acid. A valuable variety for cooking and market purposes. Season June 22.

**Sklanka.** Tree rather slow growing, but fairly stout and healthy; habit rather spreading. Fruit medium size, roundish, stalk slender, one and three-fourths inches long; color dark scarlet; flesh moderately firm, vinous

and very juicy; quality good. Season June 21. This is a hardy variety, but it has thus far not shown itself very productive.

**Spate Amarelle.** Tree rather vigorous, upright with spreading branches. Fruit medium to large, roundish, heart-shaped; stalk one and one-half inches long, stout, in a shallow cavity; color light red, with a dark blush; flesh tender, juicy, light colored; juice colorless, highly vinous; quality good. A hardy and fairly productive variety, worthy of trial for market plantations.

**Suda.** Tree quite vigorous, upright, spreading. Fruit medium size, globular; stalk one and one-fourth to one and one-half inches long, rather slender, set in a small cavity; color very dark purple; flesh tender; juice crimson; flavor acid, slightly astringent; quality rather poor. A very hardy and productive variety, ripening the 7th of July.

**Strauss Weichsel.** Tree quite vigorous, upright, spreading. Fruit medium size; roundish oblate; stalk one and one-half inches long, rather slender, set in a shallow cavity; color dark crimson; flesh tender, acid, juicy; quality good; pit rather small. Season June 22. It has thus far shown itself rather lacking in productiveness, but otherwise it is a promising variety.

**Wier No. 2.** Tree rather small, spreading. Fruit medium size, roundish oblate; stalk one and one-fourth inches long, rather stout, set in a broad cavity; color pale red, or reddish amber; flesh very tender and juicy, acid; quality good. Season June 22. A hardy and productive variety, and although rather slow in its growth, it seems to be a promising sort.

**Wragg.** Tree rather vigorous, spreading. Fruit large, roundish, heart-shaped; stalk one and one-half inches long, medium size; cavity shallow and small; color very dark crimson, nearly black at maturity; flavor acid, slightly astringent; flesh and juice light crimson, firm; quality good. Season July 4 to August 4. A productive and promising variety, somewhat like the English Morello, but with a stronger growing tree.

#### DUKES.

**Angouleme** is a Duke variety, with a round, spreading head; fruit of medium size, and oblate in form; stalk one and one-half inches long, moderately strong and set in a cavity of medium size; color scarlet, with many minute, light spots; flavor pleasant and sub-acid; flesh tender and colorless, with a light juice; quality very good. Ripe July 3 to 17. Thus far this variety has been lacking in productiveness.

**Carnation.** A strong-growing Duke variety, with a round, spreading head; ripe June 23; fruit large, roundish, slightly compressed and somewhat heart-shaped; stalk slender, one and five-eighths inches in length, in a broad, deep cavity; color light crimson; flavor pleasant, mild and vinous; texture quite firm. Until this season the variety has been lacking in productiveness, but as the trees become older, the crop has each year increased, until in 1898 it was among the most productive kinds.

**Eugenie.** Tree moderately strong, roundish, upright. Fruit large, oblate, heart-shaped, compressed; stalk one and one-half inches long, rather stout; color light scarlet or amber; flesh mild, acid, very juicy, soft and tender; quality quite good; ripe June 20. A valuable variety for dessert or cooking purposes.

**Everbearing.** Trees moderately vigorous, upright in habit, with spreading branches; ripe June 25. Fruit large, roundish oblate, slightly compressed; stalk one and one-half inches long, very stout, set in a broad, shallow cavity; color dull red, rather pale, becoming very dark when fully ripe; flesh rather tender, moderately juicy, mild, acid; quality good. An early bearing and productive variety that remains a long time in season, and is a valuable variety, especially for home use.

**Montrueil.** Tree quite vigorous, upright. Fruit ripe June 26; large, roundish, heart-shaped; stalk one and one-half inches long, moderately stout, set in a medium cavity; color amber, with a lively red cheek, slightly mottled; flesh tender, pleasant, sub-acid; flesh light colored; juice colorless; quality very good. A productive variety that is of value for home use or market.

**Olivet.** Tree quite vigorous, upright, spreading. Ripe June 25; fruit large, globular, heart-shaped; stalk one and three-eighths inches long, rather stout, set in a broad, deep cavity; color deep red or crimson, very glossy; flesh tender, rich, vinous, with a mild, sub-acid flavor; flesh red, with rose-colored juice; quality good. Is yet somewhat lacking in productiveness.

**Royal Duke.** Tree quite vigorous, upright in habit. Fruit large, heart-shaped, compressed; stalk one and one-half inches long, moderately stout, set in a rather broad cavity; color dark crimson; texture moderately firm, sprightly, vinous; quality good. A fairly productive and valuable sort, either for home or market.

#### HEARTS AND BIGARREAUS.

**Centennial.** A variety from Oregon; tree very upright, slightly spreading and fairly vigorous in growth; ripe July 9; fruit very large, heart-shaped, compressed; stalk one to one and one-half inches long, set in a very large, broad cavity; color clear, bright yellow, delicately marbled with light crimson, deepened to dark crimson in exposed specimens, and well marked with light dots and specks; flavor very sweet and pleasant; flesh tender, breaking, light colored with a colorless juice. If it proves sufficiently productive, it bids fair to be a valuable sort.

**Cleveland.** Tree quite vigorous, with a round, spreading head; ripe July 1; fruit large to very large; roundish, oblate, compressed, remotely heart-shaped; stalk one and one-half inches long, of medium size, set in a moderate cavity; color whitish yellow, with bright red blush; flavor sweet and vinous, pleasant; flesh juicy but rather firm. One of the best of the Bigarreau varieties and a valuable sort for planting in sections where sweet cherries can be grown successfully.

**Coe *Transparent*.** Tree vigorous with a roundish, spreading top; ripe June 26; fruit very large; roundish, oblate, heart-shaped with a deep cavity; stalk one and three-fourths inches, of medium size; color pale yellow, with a bright blush on one side; flavor delicate, sweet and rich; flesh very tender, light-colored; quality very good. Although it may not be of great value as a market sort, yet the handsome appearance and high flavor would make it one of the most desirable sorts for home plantations. It seems to be preferred by the birds to any of the other varieties.

**Badacsony.** A strong growing Bigarreau variety from Hungary. Tree very spreading with large, drooping leaves; fruit very large, heart-

shaped, compressed; stalk one and one-half inches long, rather slender, set in a deep, wide cavity; color red, nearly covered with dark purple, but marked with pale spots; flavor sweet, sub-acid; flesh crisp and breaking, pinkish with dark-colored juice; quality quite good. The trees are too young to judge of their productiveness, but if sufficiently productive it promises to be a very valuable variety.

**Baltavari.** Introduced at the same time as Badacconyi. Tree upright with somewhat spreading branches and large drooping leaves; season July 2 to 18; fruit large, heart-shaped; stalk one and one-fourth to one and one-half inches long, moderately stout, set in a cavity of medium depth; color light amber, nearly covered with bright carmine, in the sun and with many minute light spots; flavor rich and sprightly, pleasant; flesh melting, tender and juicy, pale amber with a colorless juice; not fully established.

**Downer.** Tree quite vigorous, of an upright habit, with spreading branches; ripe July 1, fruit quite large, roundish, heart-shaped; stalk one and one-half inches long, set in a slight depression; color a lively red, mottled with amber in the shade; flavor sweet, pleasant; flesh tender, melting. Although the trees have not as yet shown themselves to be productive, the variety has been quite thoroughly tested in other sections, and shown itself to be a valuable variety for either the home or market plantations.

**Eagle Black.** Trees quite vigorous, upright, spreading; ripe June 21; fruit quite large, heart-shaped, compressed; stalks one and one-half to one and three-fourths inches long, set in a deep cavity; color deep purple, nearly black; flavor very rich; flesh tender, juicy, deep purple with a very dark colored juice; quality very good. A variety well known for its hardness and productiveness.

**Early Purple.** Trees moderately vigorous, upright and spreading; season June 18; fruit large, roundish, heart-shaped, compressed; stalk two inches long, rather slender; color dark purple, nearly black when fully ripe; flavor sweet, vinous; flesh tender, juicy; quality very good.

**Elton.** Trees moderately vigorous, upright, spreading; ripe June 23; fruit quite large, roundish, compressed, heart-shaped; stalk one and three-fourths inches long, rather slender, set in a narrow cavity; color pale yellow, blushed with red; flavor sweet, vinous, excellent; flesh rather firm but juicy; quality very good. One of the best of the Bigarreau varieties.

**German.** Tree quite vigorous. Fruit ripe July 7; large, roundish, heart-shaped; stalk one and three-fourths inches long, quite slender, in a broad, moderately deep cavity; color very dark red, nearly black at maturity; flesh very firm, red, sweet, with a slight bitter taste; juice very dark. As yet it has not shown itself productive, or to have any valuable characteristics.

**Ida.** Trees strong growing, upright. Fruit ripe June 28, roundish heart-shaped, slightly compressed; stalk one and one-half inches long, medium size, set in a broad, shallow cavity; color carmine, with a faint blush; flesh rather firm, vinous, sweet, juicy, rich; quality very good. A valuable dessert or market variety if it proves productive. The crop in 1898 was much injured by birds.

**Napoleon.** Tree quite strong, upright, spreading. Fruit ripe July 5, quite large, heart-shaped, compressed; stalk one and three-fourths inches

long, rather stout, set in a narrow cavity; color pale, yellowish amber in the shade, with a very deep red and dark marbled crimson cheek, in the sun, richly dotted and specked; flesh very firm, juicy, sweet, excellent; quality good. One of the best of the Bigarreau cherries and a profitable variety when the fruit is not destroyed by the brown rot.

**Ohio Beauty.** Tree rather vigorous, spreading. Fruit ripe June 21, large, roundish, heart-shaped; stalk one and one-half inches long, quite slender, cavity medium; color yellowish white, mostly covered with light and dark red; flesh tender juicy, sweet, excellent; flesh and juice colorless; quality very good. A fairly productive and valuable sweet variety.

**Plymouth Rock.** Moderately vigorous, quite upright. Fruit large, heart-shaped; stalk one inch long, moderately slender, set in a small, shallow cavity; color reddish amber, with a bright red blush; flesh rather tender, juicy, light colored; juice colorless; pit round, plump; flavor sweet, pleasant. Season quite late. Trees are too young to determine their fruitfulness, but it seems to be a promising variety for home use and may prove a valuable sort for market.

**Rockport.** Tree quite vigorous, upright in habit, but becoming spreading as the trees get older. Fruit large to very large, roundish, compressed, heart-shaped; stalk one and one-half inches long, rather stout, in a moderate cavity; color pale, whitish yellow, with dark red blush; texture tender, very juicy, with a sweet, vinous and rich flavor; quality very good. Quite productive and one of the best of the sweet cherries. Season June 20.

**Tartarian Black.** Tree of vigorous growth, upright with large, glossy leaves. Fruit large, heart-shaped; stalk one and one-half inches long, rather slender, set in a broad, deep cavity; color bright purplish, blush glossy; flesh rather tender, juicy, very rich, delicious; flesh and juice purplish; quality very good. Season June 18. One of the best of the sweet cherries and fairly productive in sections where heart cherries succeed.

**Spanish (Yellow).** Tree vigorous growing, with a large and handsome head, and spreading branches. Fruit large, heart-shaped, compressed; stalk one and one-half inches long, stout, set in a broad, moderately deep cavity; color pale, whitish yellow, bordered with minute crimson dots, and deepening into bright red, and finely marbled on the sunny side; texture rather firm, juicy; flavor rich, sweet, delicious; quality very good. Season June 30. One of the most productive of the sweet cherries.

**Windsor.** Tree vigorous with upright branches, and somewhat spreading twigs. Fruit large, heart-shaped, compressed; stalk one and one-fourth to one and one-half inches long, rather slender; color bright crimson, with many light specks; flesh very firm, breaking, sweet, pleasant, vinous. Season June 29. Quite productive and a promising sort.

**Wood Gov.** Tree vigorous, upright, with spreading branches. Fruit large, heart-shaped; stalk one and three-fourths to two inches long, slender, in a medium cavity; color light scarlet; flesh very tender, mild; quality good. One of the most productive and valuable of the sweet cherries.

## PEACHES.

The trees were pruned early in April and the new growth was cut back about one-half, and a considerable amount of thinning was also done. The spraying was attended to as explained in another section and where performed before the first of April, it sufficed to prevent the attack of leaf curl, but even where the trees were free from this disease, many of the varieties failed to set a full crop. A large number of varieties, however, showed so large a crop that it was necessary to remove a considerable number of the fruits. The thinning was completed on the 15th of June.

The trees upon which the notes have been taken are, for the most part, from five to eight years old, but a few varieties were planted as early as 1888. They have been grown without crops for a number of years and have been given quite thorough cultivation, and at least every other year have received an application of either decomposed manure or wood ashes. Each spring the trees have been cut back and thinned out and as a result of this treatment, they have been kept in a compact form and the new growth is quite strong and vigorous. As a result of this treatment there is less difference in the form and size of the trees than is usually the case, and as will be observed, the notes regarding their form and size show but slight variations between the different sorts. Where trees are not cut back, a much larger proportion will develop a drooping habit than where they are pruned each year and this will account for the small number of trees to which the drooping habit is ascribed.

TABULATION OF PEACHES—(Prunus).—1900.

ABBREVIATIONS: Size—scale 1 to 10—1, very small; 10, very large. Form—o, compress d; o, oblate; ov, oval; r, round. Color—o, creamy; g, green; r, red, w, white; y, yellow. Adhesion—c, clinging; f, free; s, semi-cling. Quality—1 to 10—1, very poor; 10, best. Flowers—l, large; s, small. Glands—g, globose; r, reniform; s, surrate.

Number	Names.	Planted.	Bloomed.		Ripened.	Adhesion.	Weight of specimen in ounces.	Productiveness—Scale 1 to 10.	Form.	Color.		Quality—Scale 1 to 10.
			Date.	Size.						Skin.	Flesh.	
1	Adrian	1892	May 9	8	Sept. 24	f	4 1/2	1	rov	yr	yr	67
2	Alborge	1893	" 3	8	Aug. 3	f	8	4	r	yr	yr	34
3	Albright	1890	" 7	8	Sept. 21	f	5 1/2	1	r	cw	cw r	56
4	Allen	1890	" 9	8	Oct. 6	f	2 3	1	rov	yr	yr	56
5	Alpha	1890	" 9	8	Sept. 2	o	6	1	r	yr	yr	5
6	Amelia	1890	" 9	8	Sept. 2	f	5 1/2	2	r	cw r	w	67
7	Amsterdam	1890	" 7	8	July 23	f	6	5	ro	r	w	56
8	Barber	1893	" 9	8	Sept. 17	f	5 1/2	1	rov	yr	yr	67
9	Beers Smock	1890	" 9	8	Sept. 6	f	4 1/2	1	ov	yr	yr	5
10	Bell (Fav.)	1890	" 7	8	Sept. 21	f	4	1	ov	yr	yr	45
11	Bequett (free)	1890	" 7	8	Sept. 16	f	6	7	ov	cw r	w r	5
12	Berenice	1894	" 9	8	Sept. 19	f	4 1/2	4	ov	y	y	4
13	Bickle	1890	" 7	8	Sept. 21	f	4	5	ov	cw r	w r	4
14	Bishop	1890	" 6	8	Aug. 18	f	3	4	r	cw r	w	8
15	Blood Leaf	1892	" 7	8	Sept. 24	c	3	4	r	w r	w	1
16	Bonanza	1890	" 8	8	Oct. 10	f	3 1/2	3	rc	cw r	cw r	13
17	Boyle	1890	" 7	8	Sept. 19	f	4	4 1/2	rov	yr	yr	7
18	Brandt wine	1890	" 9	8	Sept. 23	f	6	1	rovo	yr	yr	5
19	Brigdon	1840	" 7	8	Sept. 18	f	5	3	rov	yr	yr	7 1/2
20	Briggs	1890	" 7	8	Aug. 31	f	5 1/2	2	rov	yr	yr	8
21	Bronson	1894	" 7	8	Sept. 21	f	5	1	rovo	yr	yr	67
22	Brown	1894	" 2	8	Aug. 23	f	3 1/2	8 1/2	rc	cw r	cw r	56
23	Burke	1893	" 7	8	Sept. 6	f	7	1	r	cw r	cw r	5
24	California	1895	" 7	8	Oct. 10	f	4	1	r	yr	yr	67
25	Canada	1892	" 6	8	July 23	r	4 1/2	8 1/2	r	yr	cw	45
26	Chairs	1890	" 9	8	Oct. 4	f	6 1/2	3	ov r	yr	yr	24
27	Champion (Ohio)	1890	" 9	8	July 30	o	7	5	rc	cw r	cw r	56
28	Champion (Mich.)	1894	" 9	8	Sept. 3	f	7	1	r	cw r	cw r	10
29	Chili 1	1898	" 9	8	Sept. 21	f	4 1/2	4 1/2	rovo	yr	yr	67
30	Chili 2	1898	" 9	8	Sept. 21	f	4	4	rc	yr	yr	8
31	Chinese (cling)	1890	" 9	8	Sept. 21	o	6	1	r	ow	cw r	67

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22	Claffey (Allen)	1892	9	1	1	Sept. 15	1	5%	1	1	YF	5
23	Clifton (cling)	1894	9	1	1	Sept. 21	1	5%	1	1	YF	6
24	Columbia	1890	7	1	1	Oct. 1	1	4	1	1	YF	12
25	Conkling	1890	7	1	1	Sept. 26	1	4	1	1	YF	6
26	Connecticut	1896	9	1	1	Sept. 6	1	3%	1	1	YF	6
27	Condit	1894	9	1	1	Aug. 19	1	5	1	1	YF	7
28	Coolidge (Mam.)	1895	9	1	1	Sept. 19	1	4	1	1	YF	7
29	Corser	1890	9	1	1	Sept. 19	1	4%	1	1	YF	5
30	Crosby	1892	9	1	1	Sept. 26	1	7	1	1	YF	1
31	Crothers	1890	7	1	1	Sept. 27	1	5%	1	1	YF	6
32	Dennis	1890	7	1	1	Sept. 27	1	4	1	1	YF	6
33	Diamond	1895	7	1	1	Sept. 27	1	4	1	1	YF	6
34	Draid Hill	1890	7	1	1	Oct. 1	1	4%	1	1	YF	8
35	Dumont	1894	9	1	1	Sept. 7	1	4%	1	1	YF	8
36	Dunlap	1892	9	1	1	Aug. 31	1	4	1	1	YF	7
37	Early Barnard	1898	9	1	1	Aug. 31	1	4%	1	1	YF	5
38	Early Crawford	1898	9	1	1	Aug. 31	1	4%	1	1	YF	10
39	Early Crawford 1	1898	10	1	1	Aug. 31	1	4%	1	1	YF	7
40	Early Crawford 2	1898	10	1	1	Sept. 7	1	4%	1	1	YF	7
41	Early Michigan 15	1894	9	1	1	Aug. 29	1	4%	1	1	YF	9
42	Early Michigan 16	1894	9	1	1	Aug. 29	1	4%	1	1	YF	10
43	Early Michigan 17	1894	9	1	1	Sept. 19	1	4	1	1	YF	6
44	Early Michigan 18	1894	9	1	1	Sept. 19	1	4%	1	1	YF	6
45	Early Michigan 19	1894	9	1	1	Sept. 19	1	4%	1	1	YF	6
46	Early Michigan 20	1894	9	1	1	Sept. 19	1	4%	1	1	YF	6
47	Early Michigan 21	1894	9	1	1	Sept. 19	1	4%	1	1	YF	6
48	Early Michigan 22	1894	9	1	1	Sept. 19	1	4%	1	1	YF	6
49	Early Michigan 23	1894	9	1	1	Sept. 19	1	4%	1	1	YF	6
50	Early Michigan 24	1894	9	1	1	Sept. 19	1	4%	1	1	YF	6
51	Early Michigan 25	1894	9	1	1	Sept. 19	1	4%	1	1	YF	6
52	Early Michigan 26	1894	9	1	1	Sept. 19	1	4%	1	1	YF	6
53	Early Michigan 27	1894	9	1	1	Sept. 19	1	4%	1	1	YF	6
54	Early Michigan 28	1894	9	1	1	Sept. 19	1	4%	1	1	YF	6
55	Early Michigan 29	1894	9	1	1	Sept. 19	1	4%	1	1	YF	6
56	Early Michigan 30	1894	9	1	1	Sept. 19	1	4%	1	1	YF	6
57	Early Michigan 31	1894	9	1	1	Sept. 19	1	4%	1	1	YF	6
58	Early Michigan 32	1894	9	1	1	Sept. 19	1	4%	1	1	YF	6
59	Early Michigan 33	1894	9	1	1	Sept. 19	1	4%	1	1	YF	6
60	Early Michigan 34	1894	9	1	1	Sept. 19	1	4%	1	1	YF	6
61	Early Michigan 35	1894	9	1	1	Sept. 19	1	4%	1	1	YF	6
62	Early Michigan 36	1894	9	1	1	Sept. 19	1	4%	1	1	YF	6
63	Early Michigan 37	1894	9	1	1	Sept. 19	1	4%	1	1	YF	6
64	Early Michigan 38	1894	9	1	1	Sept. 19	1	4%	1	1	YF	6
65	Early Michigan 39	1894	9	1	1	Sept. 19	1	4%	1	1	YF	6
66	Early Michigan 40	1894	9	1	1	Sept. 19	1	4%	1	1	YF	6
67	Early Michigan 41	1894	9	1	1	Sept. 19	1	4%	1	1	YF	6
68	Early Michigan 42	1894	9	1	1	Sept. 19	1	4%	1	1	YF	6
69	Early Michigan 43	1894	9	1	1	Sept. 19	1	4%	1	1	YF	6
70	Early Michigan 44	1894	9	1	1	Sept. 19	1	4%	1	1	YF	6
71	Early Michigan 45	1894	9	1	1	Sept. 19	1	4%	1	1	YF	6
72	Early Michigan 46	1894	9	1	1	Sept. 19	1	4%	1	1	YF	6
73	Early Michigan 47	1894	9	1	1	Sept. 19	1	4%	1	1	YF	6
74	Early Michigan 48	1894	9	1	1	Sept. 19	1	4%	1	1	YF	6
75	Early Michigan 49	1894	9	1	1	Sept. 19	1	4%	1	1	YF	6
76	Early Michigan 50	1894	9	1	1	Sept. 19	1	4%	1	1	YF	6
77	Early Michigan 51	1894	9	1	1	Sept. 19	1	4%	1	1	YF	6
78	Early Michigan 52	1894	9	1	1	Sept. 19	1	4%	1	1	YF	6



TABULATION OF PEACHES—(Prunus)—1888.—Continued.

Number.	Names.	Planted.	Bloomed.		Glands.	Ripened.	Adhesion.	Weight of speci- men in ounces.	Productiveness— Scale 1 to 10.	Form.	Color.		Quality—Scale 1 to 10.
			Date.	Size.							Skin.	Flesh.	
79	Hynes.....	1880	May 9.....	1	8	Aug. 16.....	8	3½	10	r	cwr	cw	5
80	Hyelop.....	1882	" 8.....	8	8	Sept. 27.....	8	6½	1	r	cwr	cw	4
81	Infant Wonder.....	1882	" 7.....	8	8	Sept. 2.....	f	4½	10	rov	cwr	cwr	56
82	Iron Mountain.....	1886	" 8.....	8	8	Oct. 14.....	f	6½	8	ovc	cw	gw	28
83	Jacques Late.....	1880	" 8.....	8	8	Sept. 21.....	f	4	2	rov	cwr	cwr	56
84	Jap-n-Dwarf.....	1884	" 2.....	1	1	Aug. 6.....	f	3½	2	ovo	cr	wr	84
85	Jersey Yellow.....	1886	" 9.....	8	8	Oct. 15.....	f	8	1	rov	yr	yr	4
86	Jones.....	1882	" 8.....	8	8	Sept. 19.....	8	8	1	rov	yr	yr	45
87	June Rose.....	1884	" 7.....	1	8	Sept. 2.....	f	5½	6½	rov	wr	wr	67
88	Kalamazoo.....	1880	" 7.....	8	8	Sept. 16.....	f	3	9	ro	yr	rr	78
89	Kalifolia.....	1882	" 7.....	1	1	Sept. 19.....	f	4	1	rov	cwr	wr	84
90	La Fleur.....	1886	" 9.....	1	1	Oct. 8.....	f	4	1	ov	yr	y	28
91	Late Barnard.....	1882	" 9.....	8	8	Sept. 16.....	f	5	5	rov	yr	yr	67
92	Late White.....	1889	" 9.....	8	8	Oct. 8.....	f	8	4	rov	cwr	cwr	5
93	Lemon Free.....	1884	" 7.....	1	1	Oct. 4.....	f	8	6	rov	y	y	4
94	Lewis.....	1880	" 9.....	1	1	Aug. 19.....	f	4	8	ro	cwr	cw	67
95	Loughurst.....	1884	" 9.....	1	1	Sept. 21.....	f	4½	8	ov	yr	yr	56
96	Lorentz.....	1885	" 8.....	8	8	Oct. 4.....	f	4½	1	r	yr	yr	56
97	Lovell.....	1882	" 8.....	8	8	Sept. 27.....	f	1½	8	ro	yr	y	78
98	Lovett White.....	1880	" 8.....	8	8	Oct. 8.....	f	3½	45	ro	w	ow	67
99	Magdalen.....	1880	" 8.....	8	8	Aug. 31.....	f	4½	45	r	cwr	cwr	89
100	Marshall.....	1880	" 9.....	8	8	Sept. 28.....	f	4	45	r	yr	yr	56
101	McCollister.....	1880	" 4.....	8	8	Oct. 1.....	f	8	56	rov	yr	yr	8
102	McKevitt.....	1882	" 9.....	8	8	Oct. 4.....	c	5½	1	rov	cwr	cwr	34
103	Milner.....	1882	" 9.....	8	8	Oct. 19.....	f	1	1	r	cwr	w	6
104	Minnie (Texas).....	1880	" 7.....	8	8	Sept. 7.....	f	3½	1	r	cwr	cwr	56
105	Moore.....	1880	" 7.....	8	8	Sept. 19.....	f	4	1	rov	cwr	cwr	78
106	Morris Co.....	1888	" 9.....	8	8	Oct. 10.....	f	5	5	r	cwr	cwr	84
107	Morris White.....	1888	" 9.....	8	8	Sept. 19.....	f	4	3	r	cwr	w	9
108	Mountain Rose.....	1888	" 9.....	8	8	Aug. 23.....	f	2	2	ro	cwr	cwr	8
109	Muir.....	1880	" 8.....	8	8	Sept. 28.....	f	7½	3	rov	yr	yr	67
110	Murat.....	1889	" 8.....	8	8	Oct. 4.....	f	7	4	rov	yr	yr	46
111	Mystery.....	1888	" 7.....	8	8	Aug. 28.....	f	8½	2	ro	yr	yr	8
112	N. Am. Apricot.....	1895	" 9.....	1	1	Sept. 19.....	f	4	2	r	yr	yr	67

Need.	1890	"	8	"	5	1	Aug. 31	.....	.....	.....	Y F	5
Nel. (Marshall).	1895	"	2	"	1	1	Oct. 4	.....	.....	.....	OW F	6
Newington (free)	1895	"	2	"	1	1	Sept. 28	.....	.....	.....	OW F	6
New Prolific	1894	"	9	"	8	2	Sept. 7	.....	.....	.....	Y F	7
Normand	1895	"	9	"	8	1	Oct. 4	.....	.....	.....	OW	5
Oceana	1895	"	4	"	1	1	Sept. 19	.....	.....	.....	Y F	6 7
Oldmixon (cling)	1895	"	1	"	5	2	Sept. 19	.....	.....	.....	OW F	5
Oldmixon (free)	1894	"	9	"	8	2	Sept. 31	.....	.....	.....	OW F	9 10
Ortolo	1894	"	7	"	1	1	Sept. 19	.....	.....	.....	Y F	4
Ostrander	1895	"	8	"	2	2	Aug. 28	.....	.....	.....	Y F	5 6
Pallas	1894	"	8	"	1	2	Sept. 28	.....	.....	.....	OW F	5 6
Palmerston	1890	"	9	"	2	1	Aug. 18	.....	.....	.....	Y F	5 6
Pansy	1890	"	7	"	5	1	Aug. 18	.....	.....	.....	Y F	5 6
Pearl	1899	"	7	"	8	2	Sept. 19	.....	.....	.....	OW F	7
Peninsular Yellow	1894	"	9	"	5	2	Sept. 30	.....	.....	.....	Y F	5
Pickett	1890	"	9	"	5	1	Oct. 4	.....	.....	.....	Y F	5 6
Pickett	1890	"	9	"	1	1	Aug. 31	.....	.....	.....	Y F	5 6
Pratt	1890	"	6	"	5	2	Sept. 7	.....	.....	.....	OW F	7 8
Prince (Raripie)	1890	"	7	"	1	2	Sept. 7	.....	.....	.....	OW F	7 8
Princess	1894	"	9	"	2	2	Sept. 30	.....	.....	.....	OW	8 9
Princess (Wales)	1899	"	7	"	1	2	Sept. 9	.....	.....	.....	OW	7
Prize 1	1890	"	9	"	5	1	Sept. 28	.....	.....	.....	Y F	6
Red Check	1898	"	7	"	2	2	Sept. 31	.....	.....	.....	Y F	5
Red Seedling	1898	"	7	"	1	2	Aug. 28	.....	.....	.....	OW F	5 6
Reed	1890	"	9	"	8	2	Sept. 2	.....	.....	.....	Y F	7 8
Reeves (Fav.)	1890	"	9	"	5	2	Sept. 2	.....	.....	.....	Y F	6 7
Riccard	1890	"	9	"	5	1	Oct. 6	.....	.....	.....	OW	5
River Bank	1892	"	9	"	9	1	July 30	.....	.....	.....	OW	6 8
Rivers	1898	"	6	"	1	1	Aug. 8	.....	.....	.....	OW	2 3
Roser	1898	"	7	"	1	1	Oct. 6	.....	.....	.....	OW	5
Roseville	1898	"	9	"	1	2	Sept. 30	.....	.....	.....	OW	6
R. S. Stevens	1891	"	6	"	8	1	Sept. 9	.....	.....	.....	Y F	6
Salway	1890	"	9	"	5	1	O. t. 10	.....	.....	.....	Y F	7
Scott	1890	"	8	"	5	1	Sept. 28	.....	.....	.....	Y F	7 8
Senar	1898	"	9	"	8	1	Sept. 13	.....	.....	.....	Y F	4 5
Shinley	1890	"	9	"	5	2	Sept. 30	.....	.....	.....	Y F	5 6
Smock (free)	1898	"	9	"	2	1	Oct. 15	.....	.....	.....	Y F	5 6
Smock I.	1892	"	9	"	2	1	Oct. 1	.....	.....	.....	Y F	5 6
Smock	1896	"	5	"	1	1	July 23	.....	.....	.....	OW	5 6
Snow Late	1890	"	9	"	8	1	Sept. 2	.....	.....	.....	Y F	5 6
Southern Early	1890	"	9	"	5	1	Aug. 30	.....	.....	.....	Y F	7 8
Spottswood	1894	"	7	"	1	1	Sept. 16	.....	.....	.....	OW	6 7
Stark Head	1898	"	8	"	5	1	Oct. 5	.....	.....	.....	OW	3
Stevens Late	1890	"	7	"	5	1	Sept. 28	.....	.....	.....	OW	5 6
Stevens Raripie	1893	"	7	"	5	1	Sept. 28	.....	.....	.....	OW	7
St. John	1890	"	9	"	2	2	Aug. 14	.....	.....	.....	Y F	7 8
Strong (Mam.)	1898	"	8	"	2	2	Sept. 17	.....	.....	.....	OW	6
Strong (World)	1897	"	7	"	5	2	Aug. 28	.....	.....	.....	OW	6

# MICHIGAN EXPERIMENT STATION

Number.	Names.	Planted.	Bloomed.		Glands.	Ripened.	Adhesion.	Weight of specimen in ounces.	Productiveness—Scale 1 to 10.	Form.	Color.		Quality—Scale 1 to 10.
			Date.	Size.							Skin.	Flesh.	
158	Summer Snow.....	1894	May 9.....	1	2	Sept. 27.....	0	4	8	ro	ow	ow	4.5
159	Sarpasser (Mel.).....	1890	" 9.....	2	1	Aug. 29.....	1	4	2	rov	yl	y	8
160	Switzerland.....	1900	" 7.....	2	2	Sept. 19.....	1	4½	4	r	ow	ow	5.6
161	Toledo.....	1894	" 8.....	1	2	Aug. 19.....	1	5	5.6	r	ow	ow	5.6
162	Toquin.....	1892	" 10.....	1	2	Aug. 27.....	1	3½	8	ro	yl	yl	7
163	Townsend.....	1892	" 8.....	2	2	Sept. 27.....	1	5	1	ro	yl	yl	5.6
164	Triumph.....	1896	" 7.....	1	2	Aug. 8.....	1	3½	8	ro	y	y	7.8
165	Troth.....	1890	" 7.....	2	2	Aug. 22.....	1	4	2	r	ow	yl	5.6
166	Wager.....	1890	" 9.....	1	2	Sept. 7.....	1	4	4	r	yl	yl	5.6
167	Walker Var. ....	1898	" 7.....	2	2	Sept. 28.....	1	4½	4.5	rov	ow	ow	7.8
168	Washington.....	1890	" 6.....	2	2	Sept. 7.....	1	4½	3.4	rov	ow	ow	6.7
169	Willatt.....	1894	" 9.....	1	1	Sept. 21.....	1	2	4	ro	yl	yl	5.6
170	Williamson.....	1892	" 9.....	2	2	Sept. 27.....	1	5½	2	rov	yl	yl	5.6
171	Wonderful.....	1890	" 9.....	2	2	Oct. 8.....	1	6	2	rov	yl	yl	6
172	Worthen.....	1890	" 6.....	2	2	Aug. 31.....	1	3½	3	rov	yl	yl	6.8
173	Yellow Rareripe.....	1898	" 9.....	2	2	Sept. 23.....	1	5	4	ovc	yl	yl	8.4

PEACHES.

**Adrian.** Trees quite vigorous, spreading. Fruit medium to large, roundish, inclined to oval; cavity rather abrupt; suture distinct only near the apex; apex scarcely apparent; color clear yellow, occasionally washed with red, with a moderate pubescence; flesh yellow, red at pit, very juicy, rather firm, mild, vinous, rich; pit free, oval, plump, pointed; quality good; season late September; flowers small or medium; glands globose. As yet not very productive.

**Advance.** Trees somewhat spreading. Fruit roundish, slightly enlarged on one side of suture; cavity deep; apex in the depression; suture distinct more than one-half around; color creamy white, mostly covered and mottled with red; pubescence slight; flesh very juicy, creamy white, rather tender, pleasant and sprightly; pit semi-cling; quality quite good; size medium to large; ripe early August; glands reniform; flowers small.

**Albright.** Trees quite vigorous, upright, with a nearly smooth foliage. Fruit medium to large, roundish, slightly pointed; cavity narrow and deep; suture slight, but more than one-half around; apex prominent; color creamy white, sometimes reddened, pubescence slight; flesh very juicy, creamy white, slightly red at the pit, tender, mild, slightly vinous; pit long, oval, free; quality good; season middle to last of September; glands globose; flowers small. Moderately productive.

**Allen.** Trees fairly vigorous, roundish, rather upright. Fruit medium size, roundish, slight ovate; cavity narrow, deep; suture slight, two-thirds around; apex prominent; color yellow, with brownish red cheek, and with considerable pubescence; flesh juicy, pale yellow, tender, high flavor but not rich; pit medium size, oval, plump, free; quality good; ripe early September; moderately productive; foliage slightly glaucous, somewhat crimped; glands reniform; flowers small.

**Alpha.** Trees moderately vigorous, roundish, upright. Fruit quite large, roundish and remotely ovate, slightly compressed towards suture; apex sunken; suture indistinct, one-half around; color rich clear yellow, much overspread with rich, dark red, with very slight pubescence; flesh juicy, yellow, firm, pleasant, rich, nearly sweet; pit large, oval, plump, cling; quality good; season middle of September; foliage crimped; glands reniform; flowers small. As yet not very productive.

**American Apricot Peach.** Trees quite vigorous, roundish, spreading. Fruit medium size, round, with a medium cavity, and a distinct, slightly sunken apex; suture distinct, one-half around; color yellow, very slightly blushed, and with a slight pubescence; flesh very juicy, light yellow, slightly colored at pit; flavor vinous, sprightly, rich, tender; pit medium size, plump, free; quality good; season middle to last of August; moderately productive.

**Amelia (of Carolina).** Trees quite productive, spreading, with drooping branches. Fruit large, roundish, tapering slightly towards the apex; cavity medium size; apex small; suture more than one-half around; color creamy white, with a red blush, washed and specked with pale, bright red; pubescence slight; flesh juicy, creamy white, bright red at pit, tender, very mild, vinous, pleasant; pit free; quality quite good; season early September; glands reniform; flowers medium size; not very productive.

**Arctic.** Trees quite vigorous, upright, with spreading branches. Fruit medium size, roundish ovate, with a rather broad cavity and a sunken apex; suture indistinct; color light, clear yellow, with a medium pubescence; flesh not juicy, pale yellow, red at pit, mild tender; pit free, oval, pointed, plump; quality fair; glands reniform; foliage partially folded, crimped, slightly waved; season early October. Thus far lacking in productiveness.

**Barber.** Trees quite vigorous, with a round head. Fruit rather large, roundish oval; cavity broad, shallow; suture quite distinct, more than one-half around; apex very prominent; color yellow, blushed and mottled with dark red; flesh moderately juicy, yellow, very red at pit, tender, mild, pleasant; pit large, pointed, plump, free; quality good; season middle of September; fairly productive.

**Beers Smock.** Trees quite vigorous; head round, open. Fruit large, oval, one side enlarged at suture; cavity narrow, deep; suture distinct more than one-half around; apex a mere point; color light yellow, with a little red on one cheek; flesh moderately juicy, yellow, red at pit, tender, highly vinous; pit large, plump, free; quality good; season early October; fairly productive; glands reniform; flowers small.

**Bell Favorite.** Trees fairly vigorous, roundish, upright. Fruit rather large, oval, tapering towards the apex, which is but a slight elevation; cavity rather deep; suture distinct two-thirds around; color yellow, with a dull red cheek, and a slight pubescence; flesh juicy, yellow, red at pit, tender, highly vinous; pit nearly free; quality fair; season middle to last of September; fairly productive; flowers small, glands globose.

**Bishop.** Trees quite vigorous, roundish, upright. Fruit medium to large, round, with a rather deep cavity and a distinct suture, one-half around; apex slight; color creamy white with a rich, dark red blush; flesh juicy, white, with a mild, vinous flavor, tender; pit medium, oval free; quality quite good; season middle of August; quite productive; glands globose; flowers small.

**Bonanza.** Trees quite strong, roundish upright; foliage nearly smooth, waved. Fruit medium size, roundish, slightly oblong, narrow towards the stalk and slightly compressed next the suture; cavity narrow, deep; suture extends one-half around, most prominent near the apex which is well marked; color creamy white, slightly red in the sun; pubescence slight; flesh moderately juicy, creamy white, red at the pit, moderately firm, mild, with a slight bitter flavor; pit plump, oval, free; quality rather poor; not very productive, apparently of no value.

**Boyle.** Tree rather vigorous, spreading, with drooping branches. Fruit medium to large, round, ovate; cavity broad and deep; apex prominent; suture slight, more than one-half around; color yellow, with a pale red blush; pubescence slight; flesh juicy, yellow, slightly red at the pit, mild, vinous, very pleasant, tender; pit large, plump, roundish oval, pointed, free; glands globose, flowers small or medium; quality quite good; season middle of September; fairly productive.

**Brandywine.** Trees rather strong, upright, with round head. Fruit quite large, oblate, ovate, compressed next the suture; cavity wide, deep, quite abrupt; apex very prominent; suture distinct, with one side enlarged; color yellow, washed, marbled and striped with red; pubescence slight; flesh juicy, tender, yellowish red at pit, mild but not rich; pit large, oval, plump, pointed, free; quality good; season last of September;

fairly productive; foliage large, crimped, waved; glands globose, flowers medium to small.

**Briggs.** Trees fairly strong, roundish, upright. Fruit large, roundish, ovate; cavity broad, moderately deep; apex generally prominent; suture distinct, more than one-half around; color yellow, with a slight blush; pubescence medium; flesh very juicy, tender, yellow, slightly red at pit, mild, rich vinous, sprightly; pit large, oval, plump, pointed, free; quality quite good; season last of August; fairly productive; foliage crimped; glands globose, flowers small.

**Brunson.** Trees quite strong, roundish, upright. Fruit large, round, remotely ovate, slightly compressed; cavity small; apex prominent; suture distinct, one-half around; color yellow, faintly blushed with a slight pubescence; flesh moderately juicy, yellow, red at pit, tender, vinous, sprightly; pit small, oval, pointed, plump, free; quality good; season middle of September; quite productive. Resembles Kalamazoo, although of a distinct origin.

**Brown.** Trees quite strong with a round head. Fruit medium size, round, compressed next the suture; cavity medium; apex in a slight depression; suture distinct one-half around; color creamy white, diffused with dull red in the sun; flesh juicy, tender, but moderately firm, creamy white; slightly red at the pit, mild, vinous; pit free; flowers large; glands reniform; quality good; season middle to last of August; quite productive. One of the most promising varieties in its season, owing to its hardness.

**Burke.** Trees moderately strong, upright, with slightly spreading branches. Fruit quite large, roundish, with a shallow, narrow cavity and a depressed apex; suture distinct, one-half around; color creamy white, slightly pink, with a light pubescence; flesh very tender, juicy, mild, sprightly, whitish, quite red at the pit; pit large, oval, long and plump, semi-cling; foliage large, slightly crimped; glands reniform; flowers large; quality good; season early September; not very productive.

**California.** Trees quite strong. Fruit large, roundish, regular; cavity deep, abrupt; suture very distinct and more than one-half around; apex very small; color yellow, washed and mottled with red, with considerable pubescence; flesh moderately juicy, yellow, red at pit, rather tender, vinous, pleasant, rich; pit small, plump, oval, pointed, free; flowers small, glands reniform; quality quite good; season early October. The trees are quite young and have now borne their first crop.

**Chairs.** Trees quite vigorous, roundish, upright. Fruit large, oval to roundish, tapering towards the apex; cavity narrow, deep; apex distinct; suture distinct more than one-half around, one side enlarged; color pale yellow, with a slight red blush and considerable pubescence; flesh juicy, rather acid, yellow, quite red at the pit, tender; pit long, large, oval, slightly pointed, free; quality good; season early October; quite productive; foliage slightly crimped; glands reniform; flowers small. A promising late variety.

**Champion.** Trees quite strong with a round head. Fruit large, roundish, with a broad and deep cavity; suture indistinct more than one-half around; apex prominent; color clear, light, creamy white, with a beautiful red blush where exposed; pubescence slight; flesh very juicy red at the pit, very tender, sweet, slightly vinous, rich, nearly white, but with a slight creamy tinge; pit free; quality very good, excellent; fairly produc-

tive; season last of August. A handsome peach that is quite promising for home use and worthy of trial as a market sort.

Chili 2 (Engle). Trees quite vigorous, spreading. Fruit large, roundish remotely ovate, compressed at the suture, which is very slightly marked; cavity rather narrow and deep; apex prominent; color yellow, with a bright red cheek and a slight pubescence; flesh juicy, tender, yellow, red at pit, very mild and rich; pit long, oval, pointed, free; quality quite good; season last of September; quite productive. A seedling from C. Engle, Paw Paw, Mich., which seems to be an improvement over its parent.

Chili 3 (Engle). Trees fairly strong, spreading. Fruit quite large, roundish, slightly oblong, compressed; cavity medium, narrow; suture slight one-half around; apex not very prominent; color yellow, with dark red cheek and a moderate pubescence; flesh quite juicy, tender, yellow, slightly red at the pit, mild, nearly sweet; pit rather large, oval, pointed, plump, free; quality quite good; season last of September; quite productive; foliage slightly crimped; glands reniform; flowers small or medium. Another seedling from Mr. Engle, which also has much merit.

Chinese Cling. Trees rather strong, roundish, upright. Fruit quite large, roundish; cavity narrow; suture and apex distinct; color creamy white, with a slight pubescence; flesh juicy, firm, creamy white, red at the pit, rather acid; pit large, long oval, pointed, cling; quality good; season last of September; as yet not very productive; foliage slightly crimped; glands reniform; flowers large.

Cleffey Allen. Trees quite strong, roundish, upright. Fruit medium to large, roundish, with a broad, deep cavity; suture slight, one-half around; apex indistinct; color yellow, with a brownish red cheek and a plentiful pubescence; flesh juicy, tender, yellowish red at the pit, mild, vinous, not rich; pit oval, plump, pointed, free; quality good; season middle of September; fairly productive; foliage crimped; glands reniform; flowers small or medium.

Columbia. Trees rather strong, upright, spreading. Fruit medium to large, roundish, slightly elongated; cavity broad, deep; suture distinct one-half around; apex very prominent; color yellow, nearly or quite covered with stripes and marblings of dull red; pubescence plentiful; flesh yellow, more or less red near the surface, and slightly red at the pit, tender, juicy, mild, with more or less bitterness; pit small, round, plump, pointed, free; quality quite poor; fairly productive; foliage slightly crimped, waved; glands reniform; flowers large; season early October. The quality is too poor to make it of any value.

Connecticut. Trees fairly vigorous. Fruit medium size, roundish, slightly compressed and enlarged at one side of suture; cavity broad, deep; suture distinct more than one-half around; apex prominent, color yellow, nearly overspread with red; flesh lacking in juice, tender, very mild and rich, yellow, red at the pit, which is small and free; quality quite good. The trees were planted in 1896, and only bore a few fruits last year.

Connett. Trees quite vigorous. Fruit large, roundish, oval, compressed; cavity small, deep, abrupt; suture very marked more than one-half around; apex in a depression; color creamy white, faintly mottled and washed with light red; very handsome; flesh quite juicy, creamy white to pit, tender, luscious, sprightly, vinous; pit oval, plump, semi-

cling; quality quite good; fairly productive. A very handsome and delicious peach which is likely to prove a valuable sort for home use.

**Coolidge Mammoth.** Tree quite vigorous, with a roundish, upright head. Fruit large, roundish, ovate; cavity rather narrow and deep; apex very prominent; suture distinct, more than one-half around; color clear, bright yellow, with a bright blush and a medium amount of bloom; flesh juicy, yellow, red at pit and with a mild, vinous and sprightly flavor; pit large, oval, pointed, free; quality quite good; season middle of September. Foliage crimped, with globose glands; flowers small.

**Corner.** Tree quite vigorous, with a round head. Fruit medium size, oval or ovate; cavity deep; apex prominent; suture distinct, more than one-half around, color yellow with bright blush and a moderate amount of bloom; flesh moderately juicy yellow, red at pit, fairly tender and with a mild, almost sweet, but not rich flavor; pit free, oval, pointed; quality good; season early September. Foliage crimped with reniform glands; flowers small or medium.

**Crosby.** Tree rather vigorous, with a spreading, drooping habit. Fruit medium to large, roundish; cavity narrow and deep; apex depressed; suture distinct two-thirds around; color yellow with a slight bloom; flesh moderately juicy, yellow, quite firm, with a mild, vinous flavor; pit free; quality good; season middle to last of September. The fruit is generally more or less mottled with red and with a deep rather dull red cheek. The pit is small, nearly pointed, plump. Foliage nearly smooth with reniform glands; flowers small.

**Crothers.** Tree strong with drooping branches. Fruit medium size, varying from round to roundish ovate; cavity medium; apex a slight elevation in the suture which extends more than one-half around; color creamy white with a bright blush in the sun and with a slight bloom; flesh very juicy, creamy white, red at pit, tender, mild, vinous and pleasant; pit large, roundish, oval, pointed, free; quality good; season last of September and first of October. Quite productive. Glands globose; flowers small or medium.

**Dennis.** Tree fairly strong, spreading, with drooping branches. Fruit medium size, roundish; cavity medium; apex a slight elevation in the suture, which is distinct two-thirds around; color yellow, with a slight bloom; flesh juicy, yellow, tender, highly vinous; pit free, large, roundish, oval; plump; quality, good; season early September. Foliage smooth with globose glands; flowers large.

**Diamond.** Tree quite strong, roundish, somewhat drooping. Fruit large, roundish, slightly ovate; cavity narrow, deep; apex scarcely distinct; suture deep, more than one-half around; color pale, clear yellow, often with a faint red cheek and a medium amount of bloom; flesh juicy, pale yellow, red at pit, firm and vinous in flavor; pit large, oval, plump, partially free; quality fair; season last of September. Flowers small with globose glands. Usually a large, handsome variety but until fully ripe the adherence of the pit is such as to class it with the clings.

**Druid Hill.** Tree quite vigorous, with a roundish, somewhat spreading head. Fruit large, roundish, inclining to ovate; cavity broad and deep; apex distinctly pointed, suture, slight more than one-half around; color creamy white, washed, mottled and specked with bright red and with a very slight bloom; flesh moderately juicy, whitish, slightly red at pit, tender, vinous, and with a sprightly flavor; pit free, quality quite



good; season last of September and first of October. Glands globose; flowers small.

**Dumont.** Trees quite strong, with upright branches. Fruit medium to large, roundish oval, much compressed; cavity narrow, deep; suture distinct more than one-half around; apex slight; color yellow, much shaded with red and with a heavy bloom; flesh moderately juicy, yellow, quite red at pit, tender, sweet; pit free; quality rather poor; season middle of September. Flowers small; glands reniform. The quality of the fruit is such that it is not likely to prove of value.

**Dunlap.** Tree quite strong, rather spreading. Fruit large, roundish, remotely ovate; cavity wide, deep; apex slight; suture distinct two-thirds around; color yellow, nearly covered with dark red; flesh yellow, red at pit, quite juicy, tender and with a rich, vinous flavor; pit large, plump, free; quality quite good, season last of August. Foliage large, slightly crimped, with globose glands; flowers small. One side of the fruit is often enlarged.

**Early Barnard.** Tree quite strong, with a roundish, upright head and slightly spreading branches. Fruit rather large, roundish; cavity narrow and deep; apex slight; suture more than one-half around; color yellow, nearly covered with dark red and with a medium bloom; flesh moderately juicy, yellow with much red at pit, moderately tender, nearly sweet; pit free; quality good; season last of August. Foliage is not crimped or folded; glands reniform; flowers small; pit rather large, plump, roundish, oval, pointed.

**Early Crawford.** Tree quite strong with a roundish top and upright branches. Fruit large, roundish, slightly elongated; cavity broad; apex usually slight; suture distinct more than one-half around; color clear bright yellow, with a red cheek and a light bloom; flesh very juicy, yellow, red at pit; fibrous, sweet, vinous, rich; pit free; quality quite good; season last of August. The fruit is sometimes compressed near the suture and is often overspread with many bright red specks. Pit large, roundish oval, pointed. Foliage large, crimped; glands globose; flowers small. One of the largest and most desirable varieties for use upon rather heavy soil in elevated locations. Its principal fault is that it starts readily in the winter or spring and its flower buds are often injured as a consequence.

**Early Crawford Seedlings Nos. 1 and 3** from C. Engle, Paw Paw, greatly resemble the parent, but do not quite equal it in quality.

**Early Michigan.** Trees quite strong, spreading. Fruit large, round; cavity broad; apex depressed; suture distinct more than one half around; color creamy, mostly overspread and dappled with dark red and with a medium bloom; flesh whitish with a little red at pit; flavor sweet, mildly vinous, rich; texture tender, juicy; pit large, plump, free; quality quite good; season middle of August. Flowers large; glands reniform. One of the most valuable of the medium early varieties.

**Ede (Captain).** Tree quite strong, upright with drooping branches. Fruit medium to large, roundish oval; cavity narrow, deep; apex slight; suture more than one-half around; color pale yellow with a dull red cheek and with slight bloom; flesh moderately juicy, yellow, red at pit, tender and with a vinous flavor; pit oval, pointed, free; quality good; season middle to last of September. Glands globose; flowers small.

**Eldred (Cling).** Trees strong, roundish upright. Fruit rather large, roundish ovate, enlarged on one side; cavity narrow and deep; apex

slight; suture distinct more than one-half around; color creamy white, blushed, with a slight bloom; flesh juicy, creamy white, firm, mild and pleasant; pit roundish oval, cling; quality fair; season early September. Foliage crimped, waved and folded; glands globose; flowers small or medium. The above name was supplied by S. B. Heiges, ex-pomologist of the U. S. Dept. of Agriculture.

Ellison. Trees fairly strong, upright. Fruit medium size, roundish, ovate; cavity narrow, shallow; suture distinct more than one-half around; apex in a slight depression; sometimes quite prominent; color yellow, with a large, dark red cheek and a thin bloom; flesh moderately juicy, yellow, red at pit, moderately tender with a mild, vinous, sprightly and rather acid flavor; pit free, small, rather plump; quality fair to good; sometimes with a bitter taste at pit; season October first; foliage crimped, waved; glands reniform, flowers small. It seems to be a hardy and rather productive variety.

Engle (Mammoth). Trees quite strong, upright. Fruit medium to large, roundish, ovate; cavity medium size; apex a slight elevation in the suture which is distinct and slightly more than one-half around; color yellow slightly reddened in the sun; bloom light; flesh juicy, yellow, a little faint red at the pit; tender, rich, mild, nearly sweet; pit free, rather large, oval, pointed; quality quite good; season early September; foliage large; glaucous, glands globose; flowers small or medium. Generally quite productive and a valuable variety for either home use or market.

Ford (New). Trees moderately vigorous, upright, with drooping branches. Fruit, large, roundish; cavity medium size; suture more than one-half around, with a slight point at the apex; color yellow, blushed with red in the sun, with a very thin bloom; flesh moderately juicy, yellow, tinged with red at pit; quite firm and with a mild, nearly sweet flavor; pit free, oval, plump, pointed; quality good; season early September; glands globose; flowers small or medium.

Ford Red. Trees quite strong, with a roundish, upright head. Fruit medium size, slightly enlarged at the suture, generally oval; cavity narrow, deep; apex slight, interrupting the suture, which is quite distinct; color creamy white with a slight blush and a moderate amount of bloom; flesh juicy, rich, creamy white, red at pit, tender and with a mild, nearly sweet flavor; pit free, oval, pointed, quite plump, with the flesh surrounding it rather bitter; quality good; season early September; fairly productive.

Ford 1. Trees quite strong, spreading. Fruit medium to large; roundish, elongated; cavity small, deep, abrupt; suture very slight; apex a mere point in a depression; color creamy white, delicately washed with bright red and with a light bloom; flesh creamy white, slightly tinged with red at pit, very juicy, tender, sprightly, very pleasant, vinous; pit very plump, semi-cling; quality good; season middle to last of August; quite productive.

Ford 2. Trees quite strong with roundish head. Fruit medium to large, roundish, remotely ovate, slightly compressed at suture which is indistinctly marked; cavity broad, rather deep; apex indistinct; color yellow, with a faint red cheek; flesh juicy, yellow, red at pit, tender, vinous; pit medium size, pointed, oval, plump, free; quality good; season last of

September; flowers small; glands globose. The trees as yet have not been very productive.

**Ford 3.** Trees quite strong. Fruit medium size, roundish, slightly compressed at the suture; cavity narrow, moderately deep; suture slight; apex indistinct; color greenish yellow, with a thin bloom; flesh moderately juicy, white, slightly tinged with red at the pit, rather tender, mild, slightly vinous in flavor; pit very plump, pointed, free; quality rather poor; season middle to last of October; glands reniform; flowers small. Rather late for this climate.

**Fox.** Trees fairly vigorous with a round head. Fruit medium size, roundish, slightly inclined to ovate; cavity medium; suture slight; apex prominent; color creamy white, with a faint blush; flesh quite juicy, yellowish-white, red at pit, very tender, and with a vinous, sprightly flavor; pit nearly round, pointed, free; quality fair; season first of October; foliage crimped, waved; glands globose; flowers small.

**Geary (Hold On).** Trees quite strong, with drooping branches. Fruit large, roundish to roundish ovate; cavity broad; suture distinct, more than one-half around, with an enlargement at one side; apex very small; color pale yellow, with a blush in the sun; flesh rather dry, yellow, red at pit, quite firm, sprightly, vinous; pit large, long, oval, pointed, free; quality fair to good; season early October; foliage slightly crimped and waved; glands reniform; flowers small. The trees have generally been quite productive.

**Globe.** Trees fairly vigorous, with stout, upright branches. Fruit quite large, round or slightly ovate; cavity broad, deep; suture slight, two-thirds around; apex not very distinct; color yellow, with a slight red cheek and a thin bloom; flesh juicy, yellow, mild, vinous, sprightly, tender; pit large, oval, plump, free; quality good; season middle of October; foliage slightly crimped; glands globose, flowers small. Usually lacking in productiveness, although the fruit is large and handsome.

**Gold Drop.** Trees fairly vigorous, drooping. Fruit medium size, roundish, slightly inclined to ovate; cavity broad, shallow; suture only marked near the apex, which is slightly developed; color rich yellow, occasionally with a light red cheek in the sun and with a thin bloom; flesh moderately juicy, yellow, tender, mild, vinous, almost sweet; pit small, oval, pointed, free; quality quite good; season middle to the last of September; foliage slightly crimped, waved; glands reniform; flowers large. The trees are usually quite productive, and unless the fruit is well thinned it is of rather small size.

**Grant (General).** Trees fairly strong, roundish, upright. Fruit medium to large; roundish, tapering towards the apex; cavity narrow, deep; suture distinct two-thirds around; apex indistinct; color pale creamy-white with a mottled cheek and a thin bloom; flesh moderately juicy, creamy white, red at pit, firm, mild, vinous, pleasant; pit medium size, roundish oval, pointed, plump, cling; quality good; season first of October; foliage crimped; glands reniform; flowers small. The fruit is often slightly compressed at the suture and is one-sided near the apex.

**Great Western.** Trees quite strong, with a roundish head. Fruit medium to large, roundish or slightly ovate; cavity narrow, deep; suture more than one-half around and quite distinct near the apex which is prominent; color creamy white with a medium amount of bloom; flesh very juicy, creamy white to the pit, which is roundish oval, pointed, plump,

cling; texture firm; flavor mild, slightly bitter; quality rather poor; season early to middle October; foliage slightly crimped, folded, waved; flowers small; glands reniform. The trees have been only moderately productive.

Gudgeon. Trees quite strong, roundish, upright. Fruit medium to large, roundish; cavity medium; suture slight more than one-half around; apex usually quite prominent; color creamy white with a bright red blush; flesh juicy, white, slightly red at pit, rather tender, and with a mild, sprightly flavor; pit free, oval, pointed; quality fair to good; season first of October; foliage slightly crimped and waved; glands reniform; flowers small. Not very productive.

Haas. Trees fairly strong, moderately spreading. Fruit medium to large, roundish; cavity broad, deep; suture scarcely distinct; color creamy white, partially washed and striped with red, and with a very light bloom; flesh yellowish white, juicy, tender, sweet or slightly vinous; pit small, oval, plump, free; quality fair to good; season first to middle of August; glands reniform; flowers large. The trees have been quite productive the past season.

Hale. Trees fairly strong, spreading. Fruit medium size, roundish; cavity quite deep, abrupt; suture well marked; apex a mere point in the suture; color creamy white with a bright cheek and a very thin bloom; flesh moderately juicy, creamy white, tender, pleasant, sprightly; pit semi-cling; quality fair to good; season middle of August. Trees are generally hardy, comparatively free from the attack of curl leaf and quite productive, although somewhat subject to brown rot.

Hale X Oblong. Trees moderately vigorous, spreading. Fruit rather large, round; cavity medium; apex slightly depressed; suture distinct one-half around; color creamy white, nearly covered with dark red and with a slight bloom; flesh juicy, tender, of a faint creamy-white color; moderately firm, sprightly, vinous; pit rather large, oval, plump, slightly adherent; quality good; season early August. The trees have been even more productive than Hale and the fruit is generally much larger and the pit less adherent. Several specimens weighed from nine to ten ounces each.

Hance (Golden). Trees fairly strong, upright. Fruit medium to large, roundish; cavity broad; suture indistinct, except near the apex, which is a mere point in the suture; color yellow, with a dark cheek in the sun and with a moderate amount of bloom; flesh juicy, yellow, red at pit, tender, mild, vinous; pit free; quality good; season early September; foliage, crimped; glands globose; flowers small. Thus far only moderately productive.

Hance Smock. Trees quite strong, roundish upright. Fruit large, roundish to roundish oval; cavity narrow, deep; suture deep, especially near the apex, two-thirds around; apex slight; color pale yellow, with a marbled red cheek where exposed; flesh moderately juicy, yellow, red at pit; tender, mild, vinous, sprightly; pit large, oval, pointed, free; quality good; season first of October; quite productive; foliage crimped, waved, folded.

Husted No. 101. Trees quite strong, with drooping branches. Fruit medium size, oval, compressed at suture; cavity narrow, rather deep; apex distinct but not prominent; suture slight except at apex; color yellow, washed with red; flesh rather dry, yellow, red at pit, quite firm, fine

grained, sweet, but not rich; pit free medium size, plump, oval, pointed; quality fair; season middle of September. The trees are too young as yet to judge of their productiveness.

Husted No. 130. Trees of this variety are now known as Oceana. Growth quite strong, roundish upright. Fruit large, roundish, compressed at suture; cavity medium, suture distinct more than one-half around; apex a mere point; color light, clear yellow with an abundance of bloom; flesh moderately juicy, yellow, red at pit, tender, vinous, sprightly, rich and pleasant; pit free, quite plump, oval, pointed; quality quite good; season early September. The young trees have thus far shown themselves to be productive. Where the specimens are fully exposed many of them have their surface marbled and streaked with red.

Husted No. 700. Trees received under the above number have been given the name of Triumph. Growth quite vigorous, roundish, rather upright. Fruit medium to large, roundish, slightly oblate; cavity rather deep, abrupt; suture indistinct except near the apex, which is slightly sunken; color yellow, marbled and indistinctly striped with red; flesh tender, juicy, light yellow, firm with a vinous, sprightly and rich flavor; pit semi-cling but becoming nearly free when the specimens are fully ripe; quality very good; season middle of August. The trees appear to be early and abundant bearers. The fruit which ripens a few days after Alexander, is of very good size when the trees are properly thinned.

Hyatt. Trees fairly strong, roundish, spreading. Fruit medium to large, round, tapering slightly towards the apex which is generally somewhat elevated; cavity medium; suture distinct, extending more than one-half around; color creamy white, overspread with two shades of red in the sun and with a very thin bloom; flesh juicy, tender, creamy white, moderately firm, and with a sprightly, vinous flavor; pit slightly adherent medium size, plump, free when fully ripe; quality good; season early August; quite productive.

Hynes (Surprise). Trees fairly strong, roundish with somewhat drooping branches. Fruit medium size, roundish; apex sunken; suture a mere line one-half around; cavity medium size and depth; color creamy white, mottled, washed and faintly striped with red and a medium amount of bloom; flesh very juicy, tender, creamy white, sprightly, vinous, pleasant; pit semi-cling; quality good; season early August. The trees seem quite productive.

Hyslop. Trees fairly strong, upright with drooping branches. Fruit medium to large, roundish with a rather narrow and deep cavity; apex fairly prominent; suture indistinct except near the apex; color light creamy white, striped or mottled with bright red in the sun and with a very thin bloom; flesh juicy, light cream-white to the pit, firm and with a mild and pleasant flavor; pit medium size, rather plump, oval, pointed, cling; quality fair; season early October.

Infant Wonder. Trees fairly strong, spreading. Fruit medium to large, roundish ovate; cavity narrow, deep; apex a slight interruption in the suture, which is rather indistinct; color creamy white with a slight blush and a thin bloom; flesh juicy, rich creamy-white, much reddened at the pit, tender, vinous, with a slight bitterness; pit rather large, oval pointed, free; quality good; season last of August; glands globose; flowers small; fairly productive.

**Iron Mountain.** Trees fairly strong; upright. Fruit quite large, oval, slightly compressed near the suture; cavity broad, shallow; suture distinct one-half around, with an enlargement at one side; apex an abrupt prominence at the end of the suture; color creamy-white, with a medium amount of bloom; flesh juicy, greenish white to the pit, mildly vinous and quite pleasant for so late a variety; flowers small; glands reniform; foliage crimped, slightly folded and waved; quality fair; season early October. Rather late for this section.

**Jacques Late.** Trees fairly strong, roundish, upright. Fruit medium to large, roundish, slightly ovate; cavity broad, shallow; suture slight two-thirds around; apex very small; color creamy-white with a light red blush and thin bloom; flesh moderately juicy, creamy-white, red at pit, tender, rather acid, slightly bitter; pit plump, roundish, oval, pointed, free; quality good; season last of September; foliage large, crimped; glands globose; flowers small.

**Jersey Yellow.** Trees quite strong, spreading. Fruit medium size, roundish oval, enlarged at one side of suture; cavity narrow, deep; apex fairly distinct; suture well marked more than one-half around; color clear yellow, slightly blushed, with an abundance of bloom; flesh moderately juicy, yellow, red at pit, quite tender, mild, with a slightly bitter flavor; pit medium size, rather plump, free; quality fair; season early October; flowers small; glands reniform.

**Jones.** Trees quite strong, roundish upright. Fruit rather large, inclined to ovate; cavity rather deep; apex prominent; suture distinct two-thirds around; color yellow, with a cheek mottled with dark red and with a medium amount of bloom; flesh juicy, yellow, red at pit, tender, vinous; pit long, oval, nearly free; quality fair to good; season middle of September; foliage much crimped; glands globose; flowers small.

**June Rose.** Trees quite strong with roundish upright heads. Fruit rather large, roundish ovate; cavity medium; apex prominent; suture well marked one-half around; color pale creamy-white with a bright red cheek and thin bloom; flesh very juicy, whitish, slightly red at pit, tender, vinous, high flavor; pit medium size, oval, free; quality quite good; season last of August; foliage slightly crimped; glands globose; flowers small. A large and handsome white peach which has generally been quite productive.

**Juno.** Trees fairly strong. Fruit large, roundish, occasionally compressed at suture; apex prominent; cavity small, deep; suture a mere line more than one-half around; color clear yellow washed with red and with a considerable bloom; flesh moderately juicy, yellow, slightly red at pit, rather firm, mild, quite rich and pleasant; pit cling; quality good; season early October.

**Kalamazoo.** Trees fairly vigorous, roundish with slightly drooping branches. Fruit medium to large, often slightly compressed at suture; apex well marked but not prominent; cavity medium; suture slight, but extending more than one-half around; color yellow, slightly washed and striped with red in the sun and with a thin bloom; flesh juicy, yellow, slightly reddened at pit, tender, vinous, sprightly, rather rich; pit rather large, oval, pointed, plump, free; quality quite good; season middle of September; foliage slightly crimped; glands reniform; flowers small. The trees are generally quite hardy and productive and it is one of the most valuable varieties of its season.

**Kallola.** Trees fairly strong, roundish upright. Fruit medium to large, roundish oval; cavity medium, rather deep; apex slightly sunken; suture distinct at apex; color creamy-white with a thin bloom; flesh very juicy, faint creamy-white, red at pit, very tender and with a vinous, slightly bitter flavor; foliage crimped and slightly waved; glands reniform; flowers large; quality fair; season middle of September; fairly productive.

**LaFleur.** Trees fairly strong, roundish upright. Fruit medium size, oval; cavity narrow; apex distinct; suture well marked more than one-half around; color yellow, nearly covered with dark red and with red stripes; bloom quite dense; flesh juicy, pale yellow, tender and with a mild, vinous flavor; pit small, oval, pointed, free; quality fair; season late September; flowers large; glands reniform; foliage slightly crimped, folded and waved.

**Late Barnard.** Trees quite strong, roundish upright with drooping branches. Fruit medium to large, roundish oval; cavity narrow, rather deep; suture distinct more than one-half around; apex prominent; color yellow with a dark red cheek and a moderate amount of bloom; flesh fairly juicy, bright yellow, red at pit, firm, sweet, rich and pleasant; pit large, plump, pointed, free; quality quite good; season middle of September. The trees are fairly productive and the fruit is often slightly compressed at one side near the suture.

**Late White.** Trees fairly vigorous, drooping. Fruit medium to large, roundish oval, slightly compressed near the suture; cavity small, shallow; apex prominent; suture well marked one-half around; color creamy-white, bright red in the sun and with a thin bloom; flesh moderately juicy, pale creamy-white, red at pit, tender and with a sprightly, vinous flavor; pit large, plump, roundish, oval, pointed, free; quality good; season last of September; quite productive.

**Lemon Free.** Trees quite strong, roundish. Fruit large, round, remotely ovate; cavity open, rather deep; apex generally well marked; suture indistinct one-half around, with the flesh at one side enlarged; color light yellow, with a greenish white tinge, and with a thick bloom; flesh pale yellow to the pit; somewhat lacking in juice, tender and with a vinous flavor; pit oval, pointed, free; quality fair. Season early October, fairly productive. Flowers large, glands reniform, foliage slightly crimped, folded and waved. Valuable for canning.

**Lewis.** Trees fairly strong with rather slender branches. Fruit medium to large, round, compressed at suture; cavity medium size; suture distinct one-half around; apex a slight depression; color creamy-white, overspread, mottled and specked with light and dark red and with a thin bloom; flesh juicy, creamy-white, slightly red at pit, tender, vinous, sprightly and pleasant; pit medium size, plump, pointed, free; foliage large; glands reniform; flowers large; quality good; season middle of August. Trees quite hardy and productive and the fruit when thinned is of good size. A valuable market variety.

**Longhurst.** Trees quite strong with a roundish head. Fruit medium to large, oval, enlarged at one side of the suture; cavity rather broad; suture indistinct; apex very prominent; color yellow with a slight red blush and a medium amount of bloom; flesh moderately juicy, yellow, red at pit, tender, fibrous, and with a vinous, sprightly and rather rich flavor;

pit oval, pointed, free; flowers large; glands globose; quality good; season last of September; quite productive.

**Lorentz.** Trees very strong, spreading. Fruit medium size, roundish, enlarged at one side of the suture; cavity narrow, deep; apex sunken; suture slight more than one-half around; color yellow, slightly blushed and with a moderate amount of bloom; flesh fairly juicy, yellow, red at pit, tender, mild, vinous and pleasant; pit medium size, rather plump, free; glands reniform; quality good; season early October.

**Lovell.** Trees fairly vigorous, drooping. Fruit medium size, roundish, compressed; cavity narrow, deep; suture distinct two-thirds around; apex a slight interruption of the suture; color bright yellow with a faint marbled blush and thin bloom; flesh juicy, yellow to the pit, tender and with a vinous flavor; pit small, roundish oval, free; foliage crimped; glands globose; flowers small; quality quite good; season middle to last of September; fairly productive.

**Lovett White.** Trees moderately strong, roundish, upright. Fruit large, roundish; cavity narrow, shallow; suture distinct more than one-half around; apex quite prominent; color creamy white, with considerable bloom; flesh quite juicy, pale creamy white to the pit, tender, sprightly and rather rich; pit free; foliage crimped; glands reniform; flowers small; quality quite good; season middle to last of September. The trees seem quite productive and it is a valuable white peach for canning purposes.

**Magdala.** Trees quite strong, roundish upright with drooping branches. Fruit medium size, roundish; cavity rather small; suture distinct; apex rather prominent; color creamy white, with a bright crimson blush and very thin bloom; flesh very juicy, creamy white, slightly red at pit, exceedingly tender and with a vinous rich flavor; pit small, oval, very plump, free; foliage crimped; glands reniform; flowers small; quality quite good; season last of August and first of September. The trees are moderately productive and although of little value for market, it is a promising dessert variety.

**Mammoth Heath.** Trees of rather weak growth, spreading. Fruit medium size, roundish, cavity narrow, deep; apex distinct; suture a mere line except at apex; color clear yellow with a thin bloom; flesh juicy, yellow, firm, very mild; pit roundish oval, rather plump, cling; foliage slightly crimped and waved; flowers large; glands reniform; quality fair; season last of September; quite productive. The trees may perhaps be untrue to name.

**Marshall.** Trees fairly vigorous, roundish, upright. Fruit medium to large, roundish, slightly oblong; cavity narrow and deep; apex a mere point in the suture, which is usually distinct two-thirds around; color pale yellow, slightly mottled with red and with a thin bloom; flesh moderately juicy, yellow, much reddened at pit, rather firm and with a flavor slightly inclined to acid; pit free; foliage nearly smooth; glands reniform; flowers small or medium; quality good; season last of September; quite productive and a promising late yellow variety.

**McCollister.** Trees fairly strong, upright. Fruit quite large, varying from oval to roundish ovate; cavity rather broad and deep; suture of medium depth extending one-half around; apex very prominent; color yellow with a dark red cheek and an abundance of bloom; flesh moderately juicy, yellow, red at pit, fairly tender and with a sprightly, vinous



flavor; pit large, long, plump and free; foliage slightly crimped; glands reniform; flowers small; quality good; season last of September; fairly productive. The size and handsome appearance of the fruit makes it a desirable sort for late market.

McKevitt. Trees quite strong, roundish, upright. Fruit quite large, roundish, oval; cavity narrow and deep; apex prominent; suture a line extending rather more than one-half around; color creamy white, with a cheek marbled with bright red, and a thin bloom; flesh moderately juicy, pale creamy white, faintly reddened at the pit; firm and mild; pit long, oval, pointed, cling; foliage crimped; glands globose; flowers small; quality fair; season last of September.

Milhizer. Trees rather strong, upright. Fruit medium size, roundish; cavity narrow, deep; apex a point in the suture which is very indistinct except near the apex; color white with a slight tinge of red, and with a medium amount of bloom; flesh moderately juicy, white to the pit, tender and vinous; pit oval, pointed, free; flowers small; glands globose; quality good; season early October.

Minnie. Trees quite strong, drooping. Fruit large, roundish; cavity broad and shallow; apex a mere point; suture distinct one-half around; color creamy white with a dappled red cheek; flesh very juicy, creamy white, red at the pit, moderately firm, vinous and pleasant; pit rather large, free; foliage crimped; glands reniform; flowers small; quality good; season last of August; quite productive.

Mountain Rose. Trees fairly strong, spreading. Fruit large, roundish, tapering slightly towards the apex and slightly compressed next to the suture; cavity deep; abrupt; suture moderate, two-thirds around; apex a point in the suture; color creamy white, blushed and sprinkled with light red spots; flesh very juicy, creamy white, reddened at the pit, tender, melting and with a mild, vinous flavor; pit large, plump, free; quality quite good; season middle to last of August. Although not especially valuable for market, its high quality makes it a valuable kind for home use.

Moore. Trees quite strong, upright. Fruit medium to large, round, slightly ovate with a broad cavity; suture only distinct near the apex which is rather prominent; color pale creamy white with a bright blush and an abundance of bloom; flesh juicy, white, red at pit, tender, sprightly, excellent; pit rather small, oval, pointed, free; quality good; season middle of September.

Morris County. Trees fairly strong, spreading. Fruit medium size, roundish; cavity medium; suture a line except at the apex; apex fairly prominent; color creamy white with a slight red cheek and a fair amount of bloom; flesh moderately juicy, creamy white, slightly red at the pit, tender and with a mild, slightly bitter flavor; pit oval, pointed, free; foliage nearly smooth, slightly waved; glands reniform; flowers small; quality fair; season middle of September.

Morris White. Trees quite strong, roundish upright. Fruit quite large, roundish; cavity medium depth; suture slight; apex medium; color creamy white, occasionally blushed; flesh juicy, white to the pit, tender, vinous, rich and excellent; pit medium size, oval, plump, free; glands reniform; flowers small; quality quite good; season early September. Generally fairly productive and a valuable white canning peach.

**Muir.** Trees quite strong, roundish upright. Fruit quite large, roundish, oval, slightly compressed; cavity broad and rather deep; suture distinct one-half around; apex generally prominent; color yellow with a slight red cheek, splashed and striped with dark red; flesh very juicy, yellow, much reddened at the pit, tender, vinous and sprightly; pit very large, roundish, oval, plump; foliage crimped; glands reniform; flowers small; quality good; season middle of September. Generally quite productive and a promising variety.

**Murat.** Trees fairly strong, spreading. Fruit quite large, roundish, inclining to oval and slightly compressed; cavity narrow, moderately deep; apex a mere point in the suture which is scarcely perceptible except at that point; color light yellow washed with red and with a fair amount of bloom; flesh moderately juicy, yellow, red at pit, rather coarse and with a mild, slightly acid and bitter flavor; pit very large, plump, pointed, free; glands reniform; flowers small; quality rather poor; season early October; fairly productive.

**Mystery.** Trees moderately vigorous. Fruit large, roundish, compressed; cavity narrow and deep; suture indistinct; apex depressed; color dark yellow, with a very dark red cheek and with red spots; flesh juicy, yellow, red at pit, rather coarse but tender and with a pleasant, vinous, rich flavor; pit free; quality good; season last of August. A fairly productive and promising variety.

**Need.** Tree moderately strong, round, upright. Fruit medium size, roundish, slightly ovate; cavity medium; apex a mere point; suture two-thirds around, not deep; flesh yellow, red at pit, very juicy, rather tender, with a mild, vinous flavor, sometimes slightly bitter; skin yellow, generally with a red cheek and an abundant bloom; quality fair; season last of August.

**Neil (Marshall).** Tree moderately vigorous, drooping, with the foliage slightly crimped. Fruit medium size, roundish, irregular; cavity rather narrow and deep; apex slightly sunken; suture distinct only at the apex; color yellow, with a light marbling of red and a thin bloom; flesh moderately juicy, yellow, tender, mild and pleasant; pit medium size, oval, roundish, free; quality fair; season early October; flowers large; glands reniform. The trees as yet seem somewhat lacking in productiveness.

**Newington (Free).** Tree fairly strong, roundish upright. Fruit medium to large, roundish; cavity medium size; apex slightly elevated; suture distinct only at the apex; color creamy-white with a dark red blush and a thin bloom; flesh moderately juicy, white, slightly red at pit, very tender and with a vinous and pleasant flavor; pit roundish, oval, plump, free; quality good; season last of September; flowers small; glands reniform; foliage crimped, nearly flat.

**New Prolific.** Tree very vigorous, roundish upright. Fruit large, roundish, slightly oval; cavity narrow, deep; apex generally well marked; suture deep, more than one-half around; color yellow, with a slight dull red cheek and a moderate amount of bloom; flesh juicy, yellow, with a very small amount of red at pit; texture firm; flavor delicate, sprightly, vinous; pit free; quality quite good; season early September. Although quite young the trees seem very productive, and, as the fruit is of good size, handsome appearance and excellent flavor, it is a promising variety either for home use or market.

**Normand.** Tree quite strong, upright, foliage slightly waved, but nearly smooth. Fruit medium size, roundish varying to oval; cavity narrow, deep; apex a slight projection; suture shallow more than one-half around; color creamy-white, with a thin bloom; flesh creamy-white to the pit, firm, quite juicy and with a mild flavor; pit slightly adherent; quality fair; season early October.

**Oldmixon (Free).** Tree quite vigorous, spreading. Fruit medium to large, roundish; cavity narrow; suture slight; apex not marked; color creamy-white, generally marbled with red, and with a thin bloom; flesh juicy, creamy-white, red at pit, tender with a sprightly, vinous flavor; pit oval, pointed, plump, free; flowers small; glands globose; quality quite good; season middle of September. One of the best of the old varieties, but as it ripens at the same time as several yellow sorts it has been generally discarded as a market sort.

**Oriole.** Tree spreading, drooping, quite strong. Fruit medium size, oval, with one side enlarged; cavity broad and deep; suture slight, more than one-half around; apex a slight enlargement in the suture; color pale yellow with thin bloom; flesh very juicy, pale yellow, with a small amount of red at pit; tender, quite vinous; pit large, plump, oval, cling; only moderately productive; quality fair; season middle of September.

**Ostrander.** Tree moderately strong, roundish, upright. Fruit medium size, roundish, remotely conical; cavity medium size; suture distinct more than one-half round; apex slight; color yellow, with a dark red cheek; flesh tender, juicy, yellow, red at pit, rather fibrous and slightly bitter, especially near pit, which is oval, pointed, plump, free; foliage large; glands globose; flowers small; quality fair; season last of August.

**Pallas.** Tree fairly strong, upright, spreading. Fruit medium size, roundish oval; apex very prominent; suture distinct one-half around; color greenish, blushed with dull red, and with a medium amount of bloom; flesh very juicy, creamy white, red at pit, quite tender, sweet and pleasant except for a slight bitterness at pit, which is large, oval, plump, free; quality fair to good; season early September; fairly productive.

**Palmerston.** Tree quite strong, roundish upright with a slightly crimped foliage. Fruit large, roundish; cavity broad, deep; apex very slight; suture one-half around and quite distinct near the apex; color yellowish-white, with a slight red marbling; flesh juicy, creamy white, red at pit; firm and mild; pit large, oval, plump, pointed, cling; quality good; season last of September; glands globose; flowers small; fairly productive.

**Pansy.** Trees fairly strong, spreading. Fruit medium to large, roundish; cavity small, deep; suture shallow more than one-half around; apex slight; color yellow, with a brilliant red cheek and a slight bloom; flesh moderately juicy, yellow to pit, rather coarse, and with a sub-acid flavor; pit very large, plump, free; quality fair to good; season middle of August. A rather shy bearer.

**Pearl.** Tree quite vigorous, roundish, with drooping branches. Fruit large, roundish ovate, with one side enlarged; cavity rather broad and deep; apex distinct; suture well marked for one-half around; color creamy white, with a bright red blush and a medium amount of bloom; flesh juicy, white, very red at pit, tender, and with a high, pleasant flavor; pit large, oval, pointed, plump, free; quality quite good; season

middle of September. Generally quite productive; foliage very slightly crimped; glands globose; flowers small. A handsome and productive variety.

Peninsula. Tree quite strong, upright, somewhat spreading. Fruit large, roundish, inclining to oval; cavity narrow, deep; apex sunken; suture shallow, more than one-half around; color yellow, washed with red and with a moderate amount of bloom; flesh very juicy, yellow, red at pit, moderately firm and with a sprightly, vinous flavor; pit rather small, plump, pointed, free; flowers small; quality good; season middle of September. Apparently lacking in productiveness.

Pickett. Tree quite strong, roundish upright. Fruit medium size, roundish, slightly inclined to ovate; cavity narrow, deep; apex a slight elevation in the suture, which is slight and more than one-half around; color yellow, with a red cheek in exposed specimens; flesh juicy, yellow, red at pit, firm and with a mild, sprightly flavor; pit large, plump, oval, cling; quality fair; season last of September; foliage nearly smooth; glands reniform; flowers small.

Pratt. Tree moderately vigorous, very spreading, with waved and crimped foliage. Fruit medium size, roundish, compressed; cavity very narrow, moderately deep; suture quite distinct; apex small; color yellow, with a red cheek and a considerable amount of bloom; flesh moderately juicy, yellow, red at pit, tender, and with a mild, rich flavor; pit quite large, free; quality good; season last of August. A fairly productive variety.

Prince (Rare-ripe). Tree quite vigorous, roundish upright. Fruit medium to large, roundish, slightly ovate; cavity broad, shallow; apex quite indistinct; suture slight, more than one-half around; color creamy white, blushed with light red and with a thin bloom; flesh juicy, white, slightly red at pit, tender and with a vinous, mild, pleasant flavor; pit long, oval, pointed, plump, free; quality quite good; season middle of September; foliage crimped, folded; glands globose; flowers small. A fairly productive variety that is valuable for home use.

Princess. Tree quite strong, roundish, upright. Fruit medium to large, roundish; cavity rather broad, deep; apex slight; suture indistinct; color pale creamy white, with a slight bloom; flesh very juicy, whitish, faintly marked with red at pit, tender and with a delicate, mild, vinous flavor; pit plump, pointed, free; flowers large; glands globose; quality quite good; season last of September.

Prize. Tree fairly vigorous, with a round head. Fruit large, roundish; cavity broad; suture slight; apex a mere point; color yellow, more or less blushed and with a thin bloom; flesh very juicy, yellow, red at pit, very tender, with a vinous, sprightly flavor; pit oval, pointed, free; foliage crimped, waved; glands globose; flowers small or medium; quality good; season middle to last of September. The size, color and handsome appearance of the fruit with the productiveness of the tree make it a valuable sort, especially for home use and local market.

Red Cheek. Tree fairly vigorous, with a roundish upright head. Fruit medium size, roundish, slightly ovate; cavity rather narrow; suture slight and with a swelling on one side; apex prominent; color yellow, with a bright red cheek and a thin bloom; flesh juicy, yellow, red at pit, tender and with a mild vinous flavor; pit rather large, oval,

pointed, plump, free; foliage crimped; glands globose; flowers small; quality good; season last of September; moderately productive.

**Red Seedling.** Tree fairly vigorous, spreading. Fruit medium size, roundish; cavity broad, rather deep; suture distinct one-half around; apex distinct; color creamy white with a bright red blush and a medium amount of bloom; flesh tender, creamy white, moderately firm, and with a mild, vinous, very pleasant flavor; pit small, oval, pointed, nearly free; foliage slightly crimped; glands globose; flowers large; quality good; season middle to last of August.

**Reid.** Tree moderately strong, with spreading, slightly drooping branches. Fruit large, roundish ovate, tapering toward apex, which is quite prominent; cavity narrow, deep; suture distinct more than one-half around; color yellow, with a bright red cheek and a thin bloom; flesh very juicy, yellow, slightly marked with red at pit, tender, vinous, pleasant; pit large, plump, pointed, free; foliage large, crimped; glands globose; flowers small; quality quite good; season last of August. A fairly productive and promising variety.

**Reeves.** Tree moderately vigorous, upright. Fruit medium to large, roundish and remotely ovate; cavity broad, deep; apex a slight prominence; suture indistinct; color yellow, with a dark red cheek and thin bloom; flesh juicy, yellow, red at pit; tender with a mild, vinous flavor; pit roundish ovate, pointed, plump, free; foliage crimped; flowers small; glands globose; quality good; season middle of September. Although a handsome variety the trees have in some seasons shown a lack of productiveness.

**Ringold.** Tree moderately strong, roundish upright. Fruit medium to large, roundish, slightly ovate; cavity rather narrow, deep; apex prominent; suture more than one-half around, with the peach enlarged at one side; color creamy white, with a medium amount of bloom; flesh very juicy, white to the pit, very tender and with a rich, sprightly flavor; pit rather large, oval, pointed, cling; foliage crimped, waved; quality good; season early October. A fairly productive variety.

**River Bank.** Tree moderately strong, round. Fruit medium to large, round; cavity broad; suture more than one-half around; apex a mere point in the suture; color greenish-yellow, with a dark red cheek, and with a thin bloom; flesh tender, very juicy, greenish or yellowish white, fine grained, mild; pit semi-cling; quality good; season last of July; quite productive.

**Rivers.** Tree quite vigorous, spreading, drooping. Fruit large, round oval, slightly compressed; cavity medium size; apex a mere point in the suture, which extends two-thirds around; color creamy white, occasionally with a slight pink blush and a thin bloom; flesh tender, very juicy, creamy white, fine grained, and with a sprightly, pleasant, vinous flavor; pit nearly free; quality good; season early August. Generally hardy and quite productive. A valuable sort for home use.

**Roser.** Tree moderately strong, roundish upright. Fruit medium size, roundish, tending to ovate; cavity narrow, deep; apex somewhat prominent; suture indistinct except near the apex; color creamy white with a plentiful bloom; flesh juicy, white to the pit, tender, with a sprightly flavor; pit long, plump, oval, pointed, free; foliage nearly smooth; glands reniform; flowers large; quality rather poor; season early October.

**Roseville.** Tree quite strong, roundish, drooping. Fruit large to very large, roundish oval; cavity narrow, moderately deep; suture slight, more than one-half around; apex a mere point in the suture; color creamy white with a thin bloom; flesh juicy, creamy white, red at the pit, firm, vinous, rich; pit large, nearly round, very plump, pointed, cling; foliage folded, crimped and waved; glands globose; flowers large; quality good; season last of September. Generally quite productive and one of the most valuable of the late cling varieties.

**R. S. Stevens.** Tree moderately strong with dense, round heads. Fruit medium size, roundish, compressed; cavity narrow, moderately deep; suture distinct more than one-half around; apex a mere point; color yellow with a dark red cheek, and an abundance of bloom; flesh juicy, deep yellow, quite red at the pit, tender, very mild, vinous; pit very small, nearly round, plump; glands reniform; flowers small; quality good; season early September. A hardy and fairly productive variety, but the fruit is rather small for market purposes.

**Salway.** Tree quite strong, somewhat spreading, with large, slightly crimped foliage. Fruit large, roundish, slightly oval with one side usually enlarged; cavity medium; suture slight more than one-half round; apex generally prominent; color yellow, with a red blush in the sun and a medium amount of bloom; flesh moderately juicy, yellow, red at pit, moderately tender and with a pleasant, vinous flavor; pit free; glands reniform; flowers small or medium; quality good; season middle of October. Generally quite productive. The fruit ripens rather late for most sections of the State, but as it can be picked while still quite green and ripened off the trees, it has been found valuable in some sections.

**Scott.** Tree moderately strong, roundish upright. Fruit large, roundish, tapering toward the apex; cavity medium size; suture generally indistinct except near apex, which is usually not very prominent; color yellow with a red cheek and thin bloom; flesh juicy, yellow, red at pit, tender, nearly sweet, but not rich; pit roundish oval, plump, free; foliage slightly crimped; glands globose; flowers small; quality quite good; season late September; fairly productive.

**Sener.** Tree fairly strong, upright. Fruit quite large, nearly round, but sometimes obscurely ovate; cavity rather narrow, deep; suture very slight, more than one-half around; apex generally prominent; color yellow, blushed and marbled with red and with a moderate amount of bloom; flesh very juicy, yellow, red at pit, quite tender, and of a mild, vinous flavor; pit large, oval, plump, free; foliage slightly crimped, folded; season middle of September. Although the fruit is large and handsome the trees are generally unproductive.

**Shipley.** Tree fairly vigorous, roundish upright. Fruit medium to large, roundish, ovate, compressed; cavity large and deep; suture distinct only near the apex, which is usually prominent; color pale yellow, with a red cheek and thin bloom; flesh juicy, yellow, tender, and with a sprightly, vinous flavor; pit free, rather large, oval, plump; foliage crimped and waved; quality fair; season middle of September.

**Smock.** Tree fairly vigorous, moderately upright, foliage slightly crimped and waved. Fruit large, roundish, slightly ovate; cavity rather narrow and deep; suture distinct only near the apex, which is a slight elevation; color yellow with a slight blush where exposed and with a dense bloom; flesh moderately juicy, yellow, red at pit, rather tender, mild.

and sprightly; quality good; season last of September. Generally quite productive.

**Sneed.** Tree fairly strong, with rather slender branches. Fruit small to medium, roundish, slightly ovate; cavity narrow and deep; suture distinct more than one-half around; apex a mere point in a depression; color creamy white, washed and mottled with bright red, and with a very slight bloom; flesh quite juicy, creamy white, tender, mild, vinous and pleasant; pit long, oval, nearly free; quality fair to good; season last of July. A promising early variety.

**Snow.** Tree fairly strong with a round head and drooping branches. Fruit medium size, roundish, oval, compressed; cavity medium; suture two-thirds around; apex a slight elevation in the suture; color yellow, with a dull red cheek and slight dappplings of red and a considerable bloom; flesh moderately juicy, yellow, very red at pit, tender, sweet, occasionally with a slight bitter taste; pit large, plump, free; quality fair to good; season early September; fairly productive; foliage crimped; glands obscure reniform; flowers small.

**Southern (Early).** Trees fairly strong, very spreading. Fruit medium size, roundish, compressed at suture; cavity medium size, deep, abrupt; suture well marked more than one-half around; apex a point in a depression; color yellow, nearly covered with dark red, and with an abundance of bloom; flesh yellow, red at pit, moderately firm, and with a pleasant, rich and sprightly flavor; pit nearly round, very plump, free; quality quite good; season last of August; fairly productive. A handsome yellow variety and one that is fairly promising for its season.

**Spottswood.** Tree quite strong, but with spreading head and drooping branches. Fruit medium to large, roundish, inclining to oval; cavity broad; suture slightly marked more than one-half around; apex indistinct; color pale creamy white; flesh very juicy, whitish, red at pit; quite tender and with a vinous, mild, pleasant flavor; pit oval, pointed, plump, free; quality good; season middle of September; flowers large; glands reniform. The trees are quite young, but seem to be early bearers and moderately productive.

**Stark Heath.** Trees fairly strong, roundish, upright. Fruit medium size, roundish, slightly oval; cavity narrow, deep; apex very prominent; suture well marked, more than one-half around, and quite distinct near the apex; color creamy white, considerably blushed when fully ripe and with a moderate amount of bloom; flesh fairly juicy, creamy white to the pit; firm and with a mild, sprightly and vinous flavor, but slightly bitter at pit, which is oval, pointed, cling; glands reniform; flowers small; foliage slightly crimped and waved; quality fair; season early October. The trees seem hardy and quite productive, but the trees seem late for this latitude. This variety greatly resembles Heath Cling.

**Steadley.** Trees quite strong, with a roundish, upright head. Fruit medium size, round, inclining to ovate; cavity narrow, of medium depth; suture slight but extending more than one-half around; apex a mere point; color creamy white, washed with pink, and with a thin bloom; flesh very juicy, white to the pit, tender and of very mild but sprightly flavor; pit rather small, oval, pointed, free; foliage nearly smooth; glands reniform; flowers small; quality quite good; season middle of September; fairly productive.

**Stevens Late.** Trees fairly strong, somewhat drooping; foliage nearly smooth. Fruit medium size, roundish; cavity rather narrow, deep; suture slight, often quite indistinct, one-half around; apex slightly elevated; color creamy white, with a bright mottled blush, and a very thin bloom; flesh moderately juicy, pale creamy white, with little red at pit, tender and with a sprightly, vinous flavor; pit roundish, oval, pointed, free; glands reniform; flowers small; quality good; season early October; fairly productive.

**Stevens Rareripe.** Trees quite strong, upright, but with drooping branches. Fruit medium to large, roundish ovate; cavity narrow rather deep; suture slight more than one-half around; color creamy white, with a dark red cheek, and a medium amount of bloom; flesh very juicy, creamy white, slightly red at pit, tender, vinous and sprightly; pit large, oval, pointed, free; foliage crimped and slightly waved; glands reniform; flowers small; quality very good. Season middle to last of September. The trees are fairly productive, and it is a valuable late variety.

**Strong (Mammoth.)** Trees quite vigorous with a round head. Fruit medium to large, roundish, remotely ovate; cavity narrow, deep; suture slight more than one-half around; apex scarcely perceptible; color creamy white, with a slight red cheek, mottled and faintly striped with dark red and with a thin bloom; flesh moderately juicy, white, red at pit, tender, mild, vinous and pleasant; pit oval, pointed, plump, free; quality good. Season middle of September; quite productive.

**Stump (The World.)** Trees quite strong, roundish upright with drooping branches. Fruit medium to large, roundish, a little oblong ovate; cavity rather wide, deep; suture shallow rather more than one-half around; apex prominent; color creamy white, with a bright red cheek, and an abundance of bloom; flesh juicy, white, slightly red at pit, moderately firm, high flavored, pleasant; pit oval, plump, free; glands globose; flowers small; quality good. Season middle to last of August.

**Summer Snow.** Trees quite strong, roundish, somewhat drooping. Fruit medium size, roundish, compressed towards the suture, which is indistinct one-half around; cavity narrow, deep; apex quite prominent; color white with a thin bloom; flesh juicy, creamy white to the pit, firm rather rich nearly sweet; pit large, roundish, oval, plump, cling; quality fair; flowers large; glands globose; young wood yellowish green. Season last of September. The trees are badly injured by the leaf-curl and, although the fruit has some merit where white cling peaches are desired for canning, it will not ordinarily be profitable.

**Surpasse (Melocoton.)** Trees fairly strong, spreading, drooping. Fruit medium to large, round, inclining to ovate; cavity narrow, deep; suture indistinct one-half around; apex a mere point at the end of the suture; color yellow, with a bright red cheek; flesh juicy, yellow, tender, vinous, sweet, excellent; pit large, plump, nearly round, pointed, free; quality quite good. Season last of August; foliage somewhat crimped; glands reniform; flowers small. The trees thus far have been but moderately productive.

**Switzerland.** Trees fairly strong, roundish, upright. Fruit medium to large, roundish, tapering slightly towards the apex; cavity medium size; suture very slight; apex not marked; color creamy white, with a broad, dark red cheek; flesh very juicy, creamy white, tender, mild and vinous; pit medium size, oval, free; quality good. Season middle to last



of August; foliage crimped; glands globose; flowers small; fairly productive.

**Toledo.** Trees quite vigorous, upright, spreading. Fruit large, roundish; cavity rather large and deep; suture more than one-half around; apex a mere point in the suture; color creamy white, washed, mottled and distinctly striped with red; flesh juicy, creamy white, slightly colored at pit, tender and with a sweet, pleasant but not rich flavor; pit plump, oval, free; quality good. Season middle or last of August. Although the trees are still young they give evidence of being early and abundant bearers, and the size, handsome appearance and high quality of the fruit renders it a valuable sort for market.

**Toquin.** Trees quite strong with a roundish head. Fruit medium size, roundish; cavity medium; suture slight, one-half around; apex sunken; color yellow, with a dull red cheek, and a thin bloom; flesh moderately juicy, yellow, slightly red at pit, tender, very mild and nearly sweet; pit very small, roundish oval, plump, pointed, free; quality quite good; season middle of September; quite productive. From their behavior thus far the trees appear to be early and profuse bearers. Foliage slightly crimped; glands reniform; flowers large.

**Townsend.** Trees quite strong, with a roundish head. Fruit large, roundish, flattened at base, compressed; cavity broad and deep; suture distinct only near the apex; apex quite prominent; color yellow, more or less blushed and mottled with two shades of red, and with a medium amount of bloom; flesh very juicy, yellow, red at pit, very tender, and with a mild, vinous, pleasant flavor; pit large, plump, oval, pointed, free; foliage crimped; glands globose; flowers small; quality good; season last of September; fairly productive. A large and handsome late variety which bids fair to be of considerable value.

**Troth.** Trees fairly vigorous, with a round head. Fruit medium size, roundish; cavity broad, medium; suture generally a line less than one-half around; apex a mere point; color creamy white, with a bright red cheek; flesh juicy, whitish, very red at pit, tender, mild, vinous, but not rich; pit free; glands globose; flowers small, or medium in size; quality fair to good; season last of August; fairly productive.

**Tuskena.** Trees fairly vigorous, upright. Fruit very large, roundish to roundish oval; cavity narrow, deep; suture, a line extending past the apex; apex sometimes depressed; color rich yellow with a dark red cheek, and a medium amount of bloom; flesh very juicy, yellow, red at pit; mild, vinous, rich and excellent; fairly firm; pit large, oval, plump, cling; quality quite good; season last of September; flowers small; glands reniform. A large and handsome late cling, which, if productive, may prove of considerable value.

**Wales (Princess of).** Trees quite vigorous, roundish, with drooping branches. Fruit medium to large, roundish, inclining to oval; cavity medium size; suture hardly perceptible; apex prominent; color creamy white with a thin bloom, frequently with a light blush or marbling of red; flesh juicy, white or greenish white, tender, vinous, sprightly; pit roundish, oval, pointed, plump, free; foliage crimped; glands globose; flowers large; quality quite good; season middle to last of September; quite productive.

**Walker (Var.)** Trees moderately strong, roundish, upright. Fruit medium to large, roundish oval; cavity medium size; suture slight, but

extending one-half around; apex usually somewhat elevated; color creamy white with a bright red cheek and a thin bloom; flesh juicy, pale creamy white, red at pit, tender, vinous and sprightly; pit roundish, oval, pointed, free; foliage slightly crimped; glands globose; flowers small; quality quite good; season last of September.

Washington. Trees fairly vigorous, upright. Fruit large, roundish, slightly ovate; cavity narrow, rather deep; suture scarcely perceptible; color creamy white with a red cheek and a medium amount of bloom; flesh moderately juicy, whitish, tender, vinous; pit roundish, oval, plump, free; foliage smooth, or very slightly crimped; glands globose; flowers small; quality good; season middle of September; quite productive.

Willett. Trees fairly vigorous, spreading. Fruit medium size, roundish, slightly ovate, compressed and enlarged at one side of suture, which is slight, extending more than one-half around; cavity medium size, deep, abrupt; apex distinct; color yellow, with a bright red blush and an abundant bloom; flesh moderately juicy, yellow, red at pit, tender, sweet, rather rich, but somewhat bitter near the pit which is small, oval, pointed, free; flowers large; glands reniform; quality fair to good; season last of September; moderately productive.

Williamson (Choice). Trees moderately strong, upright. Fruit large, roundish, slightly ovate and with a rather narrow, deep cavity; suture slight, more than one-half around; apex a distinct point in the suture; color yellow with a dark blush on exposed specimens and a thin bloom; flesh moderately juicy, yellow, red at pit, fairly tender and with a mild, vinous flavor; pit oval, pointed, free; flowers small; glands globose; foliage crimped; quality good; season middle to last of September; quite productive. A handsome and productive variety that promises to be valuable for market purposes.

Wonderful. Trees fairly strong, roundish, upright. Fruit large, roundish-oval, with a narrow and deep cavity; suture distinct, more than one-half around; apex a mere point in the suture; color yellow with a red blush when exposed, and a fair amount of bloom; flesh moderately juicy, yellow, red at the pit, rather tender and high flavored; pit large, roundish, oval, free; foliage slightly crimped and waved; glands reniform; flowers small; quality fairly good; season last of September. The fruit is quite handsome, but the trees are lacking in productiveness.

Worthen (Jennie). Trees fairly strong, spreading. Fruit large, roundish, slightly ovate; cavity deep and narrow; suture distinct, one-half around; apex prominent; color yellow, red where exposed; flesh moderately juicy, yellow, red at pit, tender, delicate, sweet and rich; pit large, oval, plump, free; glands reniform; flowers small; quality quite good; season last of August. A handsome and profitable variety if it proves sufficiently productive.

Yellow Rareripe. Trees moderately strong, roundish, spreading. Fruit medium to large, ovate, compressed; cavity narrow; suture distinct, extending more than one-half around; apex a mere point; color yellow with a bright red cheek and a medium amount of bloom; flesh juicy, yellow, red at pit, tender and high flavored; pit rather large, plump, free; glands globose; flowers small; quality fair; season early September; moderately productive.

## PEARS.

The pear trees were pruned in the early spring, heading back the new growth and thinning out surplus shoots, and, on the 12th of April, the alternate rows of trees were sprayed with copper sulphate solution at the rate of one pound to fifteen gallons of water. On the 23rd of April the remaining rows were sprayed with Bordeaux mixture. This was done for comparison to determine whether there were any increased benefits from the use of Bordeaux mixture as compared with those from the solution of copper sulphate, but no difference could be noticed during the summer. On the 27th of May, after the fruit had set, the trees were sprayed with Bordeaux mixture, containing Paris green at the rate of three ounces in forty gallons. The application was repeated on the 16th of June. As a result of these three applications, the work of the slugs and codling moths was almost entirely prevented and the fruit and foliage were quite free from leaf blight and scab. Although only a comparatively small proportion of the trees bore fruit, all of the specimens were of good size, well colored and quite free from injuries of insects and fungi.

## DESCRIPTIONS OF VARIETIES.

*Angouleme Duchess.* Trees quite vigorous, upright or slightly spreading. Fruit very large, oblong, obovate, surface uneven; cavity broad, shallow, irregular; stalk seven-eighths inch long, stout, fleshy; basin narrow, shallow, irregular; calyx small, closed; calyx tube roundish conical; color greenish yellow, with many large, russet dots; flesh white, juicy, slightly granular, with a rich, mild, vinous flavor and a buttery texture; quality good to very good; season October and November; quite productive. A valuable variety for home use or market purposes. Generally grown as a dwarf.

*Anjou.* Trees quite strong and vigorous, upright at first, becoming somewhat spreading as the trees get older. Fruit large, obtuse, pyriform, occasionally varying to conical, generally a little flattened on one side; cavity slight; stalk stout, three-fourths inch long, inclined, fleshy at insertion; basin broad, shallow, calyx small, open, segments reflexed; calyx tube cup-shaped; color greenish or occasionally clear light yellow, sprinkled with russet, and often with a brownish red cheek and many russet patches and dots; flesh whitish, melting, juicy, with a brisk, vinous and perfumed flavor; core medium size, closed, seeds long, oval; quality quite good; season October and November. A shy bearer while young, but if the trees are properly headed back, it proves very productive. One of the best varieties for home use or market.

*Ansault.* Trees fairly vigorous, upright. Fruit medium to large, roundish, oblate, pyriform; cavity slight; stalk one-half to one inch long, fleshy at base; basin narrow, rather deep, irregular; calyx closed or nearly so; calyx tube cup-shaped; color yellow, mostly covered with russet and the fruit is generally marked with russet in spots and patches; flesh white, juicy, tender, buttery, melting, aromatic; core closed, seeds oval, plump, numerous; season last of September to first of October; quality

fair to good and very productive. An early bearing variety which has some merits as a market variety.

**Barry, P. Barry.** Trees moderately strong, straggling, spreading. Fruit medium size, elongated, pyriform, slightly obtuse; cavity abrupt; stalk one inch long, medium size, inclined; basin narrow, shallow, regular; calyx small, open, segments short; calyx tube cup-shaped; flavor sweet, vinous, rich; flesh whitish, rather juicy, melting, texture firm, fine-grained, sweet, vinous and rich; quality fair; season December to April; quite productive. An awkward, straggling growing tree, but it seems to be quite productive, and the fruit apparently has a value for market purposes.

**Bartlett.** Trees quite vigorous, upright. Fruit large, oblong, obtuse, pyriform; cavity slight, three-fourths to one and one-half inches long, stout; basin stout, irregular; calyx open, segments short; calyx tube cup-shaped; color yellow, with numerous specks and patches of grayish russet, sometimes with a light red cheek; young wood often yellowish brown; flesh white, juicy, fine-grained, buttery, tender, with a musky aroma that is unpleasant to some persons; quality good; season early September; generally quite productive.

**Bloodgood.** Trees quite strong, nearly upright. Fruit small to medium, turbinate, inclining to obovate; cavity very small; stalk one inch long, fleshy at insertion, inclined; basin shallow; calyx open, medium, segments short; color yellow, sprinkled with russet dots and a net-work of markings, giving it a rusty look on one side; flesh creamy white, buttery, melting, sweet, perfumed; quality good; season middle of August. A valuable sort for dessert purposes. Growth rather short-jointed, with deep, reddish-brown wood.

**Bosc.** Trees fairly vigorous, rather upright. Fruit large to very large, pyriform, a little uneven, generally with long neck, which tapers gradually into the stalk; cavity none; stalk one and one-half to two inches long, rather slender, curved; basin shallow, even; calyx rather large, open, with short, erect segments; calyx tube cup-shaped; color dark yellow, nearly covered with patches and dots of cinnamon russet; skin rather smooth, slightly marked with red in the sun; flesh white, melting, very buttery, rich, delicious, and slightly perfumed; quality very good; season early October; generally quite productive, but as the trees make a poor growth in the nursery, it is desirable to have this variety top-worked. Valuable both for home use and market purposes.

**Boussock.** Trees quite strong, upright or slightly spreading. Fruit large, roundish, obovate, with a small, round cavity, and a stalk varying from one-half to one and one-half inches in length, stout; basin shallow, slightly ribbed; calyx large, open; calyx tube cup-shaped; flesh creamy white, juicy, buttery, melting, with a sweet, aromatic flavor; season September; quality fair to good; generally quite productive, and a valuable variety for local markets.

TABULATION OF PEARS—*Pyrus Communis*—1888.

Abbreviations—Season, months—b, beginning; e, end; m, middle. Form—e, elongated; i, irregular; o, oblate; ob, oblong; obo, obovate; obt, obtuse; ov, ovate; p, pyriform; r, round; t, turbinate. Color—b, brown; c, crimson; g, greenish; r, red; ru, russet; w, whitish; y, yellow. Texture—b, but-tery; f, firm; g, granular; m, melting; t, tender; b, breaking. Flavor—a, acid; n, mild; as, asstringent; j, juicy; s, sweet; v, viscous; p, per-fumed. Use—d, dessert; k, kitchen; m, market. Origin—Fr, France; Eng, England; Belg, Belgium; Rus, Russia; Eur, Europe.

Number.	Names.	Planted.	Bloomed.	Season.	Vigor— Scale 1-10.	Origin.	Product— Scale 9-10.	Weight in ounces.	Form.	Color.		Texture.	Flavor.	Quality— Scale 1 to 10.	Use.
1	Angouleme.....	1891	May 8	Oct. Nov ..	9 10	France.....	10	17 5	ob obo	gy ru	w	b	m	7	m
2	Anjou.....	1888	" 10	Oct.....	10	France.....	8 4	5	obt p	gy rr	w	m	v p	8 2	d m
3	Anson.....	1889	" 10	Sept. Oct.	10	France.....	10	6 5	obo obt p	y w	w	f	v p	6	d m
4	Berry (P.).....	1892	" 16	Dec. Apr.	7 8	California.....	2	7	sp obt	y ru	w	b	v p	4	d m
5	Bartlett.....	1891	" 9	m Sept.	8 9	England.....	4	8	obo obt p	y ru	w	t b	v p	6	d m
6	Bloodgood.....	1888	" 9	m Aug.	10	New York.....	8 9	8 5	t obo	y ru	y w	b m	s p	5 6	d
7	Bosc.....	1888	" 11	Sept. Oct	10	Belgium.....	4 5	10	p i	y ru	w	b m	s p	10	d m
8	Boussac.....	1891	" 9	Sept. Oct.	10	Belgium.....	4 5	6 5	r obo p	y ru	w	b m	s j p	6 8	d m
9	Buften.....	1891	" 10	Oct. Nov.	10	Rhode Island.....	5	9 5	t	y ru	w	t b g	v p	7 2	d m
10	Clapp Favorite.....	1888	" 12	b m Sept.	10	Massachusetts.....	10	9 5	r obo obt p	y br u	w	b m	v	6 7	d m
11	Comice.....	1891	" 10	m Oct.	7 8	France.....	10	9 5	r obt	g br	w	b m	j s p	6	d m
12	Dana Honey.....	1888	" 10	Oct. Jan.	10	Massachusetts.....	10	4 5	obo obt p	r ru	y w	g m	s p	10	d
13	Debarbon.....	1891	" 10	Aug.....	9 10	Massachusetts.....	10	4 5	r p	y ru	w	m	s j	8 6	d
14	Desportes.....	1891	" 10	Aug.....	9 10	France.....	9	5	p	g ru	w	m b	s	3 2	d m
15	Dronard.....	1891	" 12	Oct. m Nov.	9 10	France ?.....	4	13	r obo obt i	y ru	w	t b	s p	4 5	d m
16	Duchamel.....	1891	" 11	m Oct.	7 8	France.....	1	4	obt obo p	y ru	w	m g	v s	7 8	d ?
17	Early Duchesse.....	1892	" 11	m Oct.	7 8	France.....	4 5	7	obo obt p	y ru	w	t b m	v s	6 7	d m
18	Eschscholtz.....	1893	" 12	Sept. Oct.	10	New York.....	2 8	8	obo obt p	g y	w	m	s	6 6	d m
19	Elizabeth (Manning).....	1891	" 9	Aug.....	9 10	Belgium.....	9 10	8 4	r obo	y r	w	m	v f	6 6	d m
20	Esperance.....	1891	" 9	Oct. m Nov.	9 10	Belgium.....	8 4	4	r obt p	g ru	w	g m	v f	4 5 7	d m
21	Ft. Water.....	1891	" 11	Oct.....	7 8	New York.....	5	7	obo obt p	y ru	w	b m	s	8 9	d
22	Early Duchesse.....	1891	" 9	m Sept.	10	Belgium.....	8 9	10	o obt p	y ru r	w	m	s j	7 7	d m
23	Fond Clapp.....	1893	" 11	Sept. Oct.	10	Massachusetts.....	9 10	11	r obo p i	y ru	w	b m	v	9 7	d m
24	Giffard.....	1893	" 9	Aug.....	9	France.....	4	8	p	g y r	w	m	j v p	9 10	d
25	Gray Doyenne.....	1888	" 9	Sept. m Nov.	9	France.....	4	8	ov obo p	ru	y w	b m	r o b	8 10	d.
26	Groveland.....	1890	" 9	m Nov.	9	Alabama ?.....	5	9	obo obt p	y ru	w	t m b	s p	8 9	d m
27	Howell.....	1889	" 9	Sept. Oct.	8 9	Connecticut.....	5 6	7 6	f p	y ru	w	m	v	8 6	d m
28	James.....	1890	" 9	Oct. Nov.	8	Pennsylvania.....	8 9	4	obo p	y ru	w	g b	s v	6 6	d
29	Jefferson.....	1891	" 9	Oct. m Nov.	9	Pennsylvania.....	8 9	6	r obo obt p	y ru	w	g m	s p v	8 4	d m
30	Kentucky ?.....	1891	" 10	Sept.	10	Kentucky ?.....	8 4	4	t obo	y ru	w	m g	s m	8 4	m ?

21	Kraus 41	1886	May 18	Sept.	9	New York	few	8.75	p	y ru	w	t <sup>b</sup>	s	84	?
22	Lawrence	1888	" 9	m Oct. Dec.	8	New York	56	6	obo obt p	y ru	w	m	s p	89	d m
23	Lawson	1889	" 10	m Aug.	9	New York	12	6.5	obo p	y ru	w	g b	s	84	m
24	Longworth	1891	" 9	Sept.	10	Ohio	1	7	r	y	w	m	s	89	d m
25	Lucrative	1888	" 11	m Sept.	9	Europe	67	7	obo p	y	w				
26	Margaret	1889	" 10	Aug.	9	Ohio	10	5	obo	y g	w	t b	v	8	d
27	Marguerite Pettie	1890	" 10	Aug.	9	France	10	1.75	obt p	g y ru	w	b m	s j p	66	d
28	Millett	1891	" 10	Dec. May	8	Europe	45	7	r obo obt p	g y ru	w	r b	v	66	k
29	Mount Vernon	1888	" 9	Oct. Nov.	9	Massachusetts	10	6	r obo obt p	y ru	w	t b m	j v p	78	m
30	Ogrean	1891	" 9	Oct. Nov.	8	Europe ?	9	9	cbo obt p	y r ru	w	b	v	67	
31	Onondaga	1891	" 10	Sept. Nov.	10	New York	6	10	ov obo o p	y ru	w	b m	v p	7	m
32	Pittmanston	1901	" 10	Oct. Nov.	8	England	56	77	ob obo p	y ru	y w	m b	v	78	d m
33	Reeder	1890	" 9	Oct. b Nov.	8	New York	8	10	r obo obt p	y ru	w	b m	v	10	d
34	Reeder	1898	" 10	m Aug. m S.	9	Europe	8	8	obo p	y b ru	w	m b	s v p	7	m
35	Rutter	1892	" 9	m e Oct.	10	Pennsylvania	9	10.5	r p	y g ru	w	b m	s v	7	
36	Seckel	1888	" 10	Oct.	9	Pennsylvania	67	8	obo	y b r	w	b m	s v	10	d
37	Sheldon	1890	" 11	Oct.	10	New York	6	5.5	r obt obo	y b ru	w	m	s v p	78	m d
38	Sterling	1888	" 9	Aug. b Sept.	10	New York	5	4.5	r t	y ru	w	m	s	66	m
39	Summer Doyenne	1888	" 9	e Sept.	10	Belgium	5	1.5	r obo	y b	w	t b m	s v p	5	d
40	Victor	1891	" 11	Oct.	10	Belgium	1	9	obt p	y	w	t b b	s p	78	d m ?
41	Winter Nella	1888	" 13	Oct. m Jan.	9	Belgium	89	6	obo p	y ru	w	t b m	s p	10	d m
42	Zache	1894	" 13	e Oct. Dec. ?	10		few	11	r o	y	w	g	s	23	?

**Buffum.** Trees strong growing, very upright. Fruit medium to large, oblong, obovate, with one side larger than the other; cavity very slight; stalk stout, three-fourths to one inch long; basin of medium size and depth, plaited; calyx small, open, segments partially reflexed; calyx tube cup-shaped; color a greenish yellow, sprinkled with small, brown dots, and more or less marked with bright red and russet; flesh creamy white, moderately juicy, tender, buttery, granular, sweet, excellent; quality fair to good; season October to November. An early bearing, productive variety.

**Clapp Favorite.** Trees very vigorous, upright. Fruit large, turbinate; basin broad, plaited; cavity none; stalk one to one and one-half inches long; quite stout, fleshy at insertion; calyx irregular, open; calyx tube funnel-shaped; color yellow, with brownish-red cheek, surface overspread with many brownish-red dots; flesh white, juicy, when fully ripe buttery, melting, and with a vinous, sprightly, rich flavor; seeds few, long, ovate, pointed; season early September; quality fair to good; young wood stout, dark brown. As a rule a productive sort, but the trees are subject to the attack of pear blight, and the fruit is inclined to rot at the core when ripe.

**Comice.** Trees large, upright. Fruit large, roundish, pyriform, or broad, obtuse, pyriform; cavity shallow, often russeted; stalk short, stout, inclined; basin large, deep, uneven; calyx small, open; color greenish-yellow, becoming clear yellow at maturity, often lightly shaded with crimson and fawn in the sun, and with light nettings and patches of russet and numerous russet dots; flesh white, juicy, melting, a little buttery, with a fine texture, and sweet, rich, sprightly and aromatic flavor; quality good; season October to November; quite productive.

**Dana's Hovey.** Trees quite strong with upright growth; young wood brownish-green. Fruit medium size, obovate, obtuse, pyriform; cavity slight, sometimes upon an irregular protuberance; stalk one-half to one inch long, moderately stout, curved, basin narrow, rather deep, often irregular; calyx rather large, open; color yellow, russeted, flesh very juicy, yellowish-white, slightly granular, half melting, with a sweet, perfumed and rich flavor; quality very good to best; season October to January. One of the best winter varieties for dessert purposes, owing to its productiveness and high quality, which rivals the Seckel.

**Desportes.** Trees quite vigorous, very upright. Fruit medium size, pyriform, tapering towards the stem; basin open, slightly ribbed and russeted; calyx partially closed, stout; cavity uneven; stalk three-fourths to one inch long, very stout, inclined; color green, slightly blotched and speckled with russet, with a pale red cheek where exposed; flesh creamy white, melting, buttery, sub-acid, not rich; season August; quality fair; quite productive.

**Drouard.** Trees quite strong, of an upright and slightly spreading form. Fruit quite large, roundish, obovate, obtuse, somewhat irregular; cavity deep, small, irregular; stalk three-fourths inch long, rather stout; basin medium, shallow, slightly irregular; calyx small, partially closed; color yellow, considerably washed, netted and speckled with russet; flesh creamy white, tender, buttery, and with a sweet, perfumed flavor; quality good; season October and November. The young trees as yet have been but moderately productive, but if they prove to be free bearers, it will probably be a valuable market variety.

**Duhamel (du Monceau).** Trees quite vigorous with an upright growth. Fruit medium size, obovate, obtuse, pyriform; cavity very slight; stalk one and one-fourth inches long, stout, fleshy at insertion, generally inclined; basin rather narrow, shallow, sometimes slightly corrugated; calyx open or half closed; color yellow, with many russet specks and patches of gray or cinnamon russet; quality quite good; season October and early November; fairly productive.

**Early Duchess (*Duchess Precoce*).** Trees fairly vigorous, upright. Fruit large, obovate, obtuse, pyriform; cavity narrow, shallow; stalk one inch long, medium, often inclined, fleshy at insertion and occasionally lipped; basin shallow, abrupt, regular, slightly ribbed; calyx small, open, segments erect; color yellow, frequently with a flushed cheek, and with numerous russet specks and with blotches, spots and tracings of light cinnamon russet; flesh whitish, very juicy; core compact; texture tender, fine grained, buttery, melting; flavor vinous, sprightly, with a peculiar aroma; season October; quality quite good; fairly productive.

**Edmonds.** Trees quite vigorous, upright or slightly spreading. Fruit of medium size, obovate, obtuse, pyriform; cavity none; stalk stout, curved, two inches long; basin broad, shallow, corrugated; calyx large, segments crumpled, open; color pale greenish-yellow; flesh fine grained, whitish, juicy; flavor sweet, juicy, peculiar; texture half melting; quality good; season September and October. As yet somewhat lacking in productiveness.

**Elizabeth (*Manning*).** Trees quite strong, roundish, conical. Fruit medium size, roundish, obovate; cavity very slight, lipped; stalk one-half to one inch long, generally inclined; basin broad, shallow, regular, slightly corrugated; calyx rather large, open; color pale yellow, with a bright red cheek and sometimes flecked with brownish russet and numerous dark spots; flesh white, juicy, fine grained, buttery; flavor sweet, perfumed; quality quite good; quite productive; season last of August; young wood dark brown.

**Esperen.** Trees strong, upright, spreading. Fruit medium to large, roundish, obtuse, pyriform; cavity shallow, slightly plaited; stalk one and one-fourth to one and one-half inches long, inclined; basin deep, acute; calyx medium, open, segments upright; color light green, mostly covered with cinnamon russet in specks and patches, and with many russet dots; flesh creamy white, juicy, tender, granular, melting, and with a highly vinous flavor; quality good; season October and November; quite productive.

**Fitzwater.** Trees of fair growth, upright. Fruit medium to large, obovate, obtuse, pyriform; cavity very slight or none; stalk one-fourth to three-fourths inch long, stout, inclined, fleshy at insertion; basin narrow, shallow, slightly abrupt; calyx small, open; color yellow, with numerous spots, tracings and blotches of cinnamon russet, especially about the apex; flesh white, very juicy, fine grained, buttery, melting; flavor sweet, sprightly and with a pleasant aroma; quality good; season October; quite productive. A promising variety for dessert or market purposes. Young wood yellowish-brown, foliage rather small, petiole short, leaf slightly cupped and waved.

**Flemish (Beauty).** Tree quite vigorous, with an upright head. Fruit quite large, obovate, obtuse, pyriform; cavity narrow, round; stalk one to one and one-half inches in length, stout, slightly inclined; basin small,



round; calyx short, open; color pale yellow mostly covered with marblings and patches of russet and often becoming reddish-brown at maturity on the sunny side; flesh white, juicy, rather fine-grained, melting, very saccharine and rich, with a slight musky flavor; quality good; season middle of September. A desirable variety for market or home use, except that it is subject to blight and when unsprayed it is seriously injured by pear scab and leaf blight.

Frederick Clapp. Tree quite strong, with an upright head and drooping branches. Fruit quite large, roundish, inclining to obovate, sometimes irregular; cavity small, shallow, irregular, stalk one inch long, stout, inclined; basin medium, regular; calyx small, open, segments erect; color clear yellow, with a few brown patches; flesh whitish yellow, very juicy, fine grained, buttery, melting, and with a highly vinous and rich flavor; quality quite good; season the last of September and October. The trees seem to be very productive and it is apparently a very valuable variety either for home use or market.

Gakovsk. Trees upright with spreading, slender shoots. Fruit small to medium, pyriform; cavity very slight with a fleshy ring about the stalk which is one and one-fourth to one and one-half inches long; basin very shallow, grayish; calyx large, open, with upright segments; color greenish yellow, with indistinct dots; flesh dingy white, fine grained, buttery, nearly seedless; core small, nearly closed; flavor mild, vinous, but not rich; season early August. Shoots olive colored; foliage rather narrow, slightly folded and recurved; quality rather poor. It seems to have little to commend it when we have other varieties at the same season that excel it in every respect.

Giffard. Trees moderately strong, upright, with slender branches. Fruit medium to large, long, pyriform; cavity none; stalk one-half inch long, stout, inclined, fleshy at insertion; basin narrow, smooth, shallow; calyx medium, open; segments long, upright; color greenish yellow, with a dull red cheek, thickly sprinkled with red dots; skin quite smooth; flesh white, tender, juicy, melting, and with a vinous, perfumed flavor; core very small, compact; seeds few, long, oval, pointed; quality quite good; season first to the middle of August. One of the best pears of its season.

Groveland. Trees fairly vigorous. Fruit large, obovate, obtuse, pyriform; cavity medium, abrupt, regular; stalk one-half to three fourths inch long, very stout, inclined; basin narrow, shallow, regular; calyx small, open, segments recurved; color greenish-yellow, with a brownish cheek and with most of the surface washed, netted and specked with russet; flesh creamy white, juicy, tender, melting, buttery, and with a sweet perfumed and slightly vinous flavor; core small, open; seeds few, oval, pointed; quality good; season middle of October and November. The trees were received from Alabama and if they prove productive, it is likely to become a valuable variety.

Howell. Trees fairly vigorous, upright. Fruit large, roundish, pyriform; cavity usually none; stalk three-fourths to one and one-eighth inches long, sometimes lipped; basin rather large, shallow, uneven; calyx open, segments recurved; color light yellow, frequently with a blush in the sun and with the surface thickly sprinkled with russet dots and some russet patches; flesh whitish, very juicy, melting, brisk and vinous; core closed, seeds few; quality good; season last of September. A valuable variety either for home use or market.

**Jones.** Trees quite strong and upright with the young shoots of a dull olive brown. Fruit medium size, obovate, pyriform, cavity none; stalk medium size, one and one-fourth inches long, inclined, fleshy at insertion; basin broad, shallow, uneven; calyx open; color yellow, shaded with russet and bright crimson in the sun; flesh white, rather coarse, granular, buttery, sugary and with a brisk, vinous flavor; quality fair to good; season October. Only moderately productive.

**Keiffer.** Trees very vigorous, upright, with large, dark green, glossy foliage. Fruit large, roundish oval, narrowing at both ends, usually with largest diameter near the center, although in some specimens the form is roundish, inclining to oblong, obtuse, pyriform; stalk one-half to three-fourths inch long, moderately stout, set in a medium cavity; basin medium, a little uneven; calyx open, segments nearly erect; color deep yellow, orange in the sun, and with a red cheek and a few patches, nettings, dots and specks of russet; flesh whitish, juicy, and when properly grown and ripened, half melting, although it is inclined to be a little coarse, granular and crisp; flavor sweet, somewhat spicy and vinous; core slightly open, medium; seeds plump, oval; quality fair in sections where the season allows them to develop and when they are ripened in the house; season October and November. The trees are early and productive bearers, but in some sections are much troubled with pear blight.

**Kentucky.** Trees very strong and spreading. Fruit medium size, short turbinate, inclined to obovate; cavity small, uneven; stalk one inch long, slender, inclined; basin narrow and deep; calyx large, open, segments upright; color clear yellow, with slight nettings of russet and many brown dots and specks; flesh creamy white, somewhat lacking in juice, rather coarse and granular, and with a slight, rather mild flavor; quality rather poor; season middle of September. This variety seems to have little to recommend it.

**Kraus 41.** Trees fairly vigorous, with an upright head and slightly spreading branches. Fruit medium size, regular, pyriform; stalk one and one-half inches long, much inclined at insertion by a lip in a small cavity; basin broad, medium, plaited; calyx medium size, closed, segments moderately long, reflexed; color yellow, with numerous green and brown specks; flesh white, somewhat lacking in juice, tender, buttery, sweet; core closed; quality rather poor; season last of August.

**Lawrence.** Trees fairly strong, somewhat spreading; young wood dull yellowish-brown. Fruit medium to large, obovate, obtuse, pyriform; stalk stout, one to one and one-half inches long in a narrow, irregular russeted cavity; calyx small, partially open, with short, persistent segments in a broad, shallow uneven basin; color yellow, with traces and occasional patches of russet and numerous brown dots; flesh whitish, juicy, melting, with a sweet and aromatic flavor; quality quite good; season October to December. The trees are usually quite productive and it is generally considered one of the most valuable early winter varieties.

**Lawson.** Trees quite strong, upright. Fruit medium to large, obovate, inclined to pyriform; stalk three-fourths inch long, stout fleshy, inclined, in a very slight cavity; calyx large, open, segments reflexed, short, in a broad, shallow, slightly corrugated basin; flesh whitish, rather dry, coarse and breaking; flavor sweet; color yellowish orange, striped with pinkish red and marked with a few dark specks; core small, compact; seeds

roundish oval; quality rather poor; season middle of August. A handsome variety but of little value otherwise.

**Lucrative.** Trees rather strong, upright. Fruit large, varying from obovate to long pyriform; stalks one and one-fourth inches long, stout, often fleshy at insertion and somewhat inclined; cavity none; calyx large, open, in a broad shallow basin; color greenish-yellow at maturity; flesh whitish, juicy, melting, with a sugary, rich and delicious flavor; quality quite good; season last of September; core closed; seeds few, long, ovate, pointed; young wood yellowish-brown. The variety is generally productive and is an excellent sort for home use.

**Margaret.** Tree quite strong, upright. Fruit medium to large, obovate, conical; stalk medium size, one and one-half inches long, inclined, in a narrow, deep cavity; calyx irregular, in a broad, shallow plaited basin; segments partially reflexed; color yellowish-green with many large, greenish dots; surface slightly uneven; flesh white, juicy, tender, buttery, with a vinous, sprightly flavor; core small, closed; seeds few; quality good; season middle to last of August. A productive variety of high quality, which is valuable for home use.

**Marguerite (Petite).** Tree fairly vigorous and very upright. Fruit quite small, obtuse pyriform; stalk one and one-half to two inches long, stout, inserted with a ring; cavity none; calyx open, segments fleshy, generally upright, in a broad, very shallow and slightly irregular basin; color greenish-yellow, with a brownish-red cheek, and with numerous red dots; flesh white, moderately juicy, crisp, breaking, sweet and perfumed; seeds few; quality good; season middle of August. A handsome pear of good quality, but its size is rather small.

**Millett.** Tree rather strong, quite upright. Fruit large, roundish, ovate, obtuse, pyriform, often irregular; stalk one inch long, rather stout, inclined, in a cavity of moderate size, generally irregular; calyx large, open, in a regular, rather deep basin; color greenish yellow, with much russet in blotches and irregular dots and specks; flesh white, firm, breaking, highly vinous; quality good; rather late for this section, as the fruit failed to ripen, but it seems to have good keeping qualities, as specimens were sound and in good condition the first of the following June.

**Ogereau.** Trees quite strong, very upright. Fruit large to very large, varying from obovate to pyriform, sometimes oblong obovate pyriform; stalk one-half to one inch long, stout, fleshy at insertion, generally in a shallow cavity; calyx open, of medium size, in a broad, shallow, plaited basin; color yellow, nearly covered with cinnamon russet and with a faint blush when exposed; flesh white, juicy, crisp and breaking, with a mild, vinous, pleasant flavor; core closed, seeds few; quality good; season middle of October and November. Young wood yellowish olive and generally stout. The variety seems to be an early and profuse bearer and valuable either for home use or market purposes.

**Onondaga.** Tree very vigorous, with an upright head but with spreading branches. Fruit quite large, obovate and sometimes oblate pyriform; stalk one inch long, stout, inclined and often curved, and inserted with a lip in a slight cavity; calyx closed, in a narrow, shallow, plaited basin; color rich yellow at maturity with roundish russet dots; flesh whitish, very juicy, slightly granular, buttery and melting, with a rich, vinous, aromatic flavor; quality good. Season last of September to November.

Young wood olive brown. Generally quite productive and a valuable market variety.

**Pitmaston (Duchess.)** Trees quite vigorous, upright, spreading. Fruit very large, oblong, obovate, remotely pyriform; stalk three-fourths inches long, moderately stout in a small uneven cavity; calyx small, closed, with upright segments; color yellow, with light russet near the stalk and with many russet dots and specks over the whole surface which is often somewhat irregular; flesh yellowish, juicy, melting, buttery and with a very sprightly, vinous flavor; quality good; season middle of October and November; seeds few, abortive. A promising market and culinary variety, differing but slightly from Angouleme.

**Reeder.** Trees quite strong, upright. Fruit large, roundish ovate, obtuse pyriform; stalk one and one-half inches long, moderately stout and fleshy at insertion; cavity none; calyx large, open, segments reflexed in a broad, shallow, regular basin; color clear light yellow, with numerous russet dots and occasional patches of russet, especially near the calyx, and with a faint reddish cheek; flesh white, juicy, buttery, melting, with a rich and vinous flavor; quality quite good. Season middle of October and November.

**Butter.** Trees vigorous, upright. Fruit quite large, roundish pyriform; stalk one inch long, stout, inclined, curved, in a narrow, abrupt cavity; calyx small, nearly or quite closed, segments narrow, nearly erect in a shallow, broad, uneven basin; color yellow, sprinkled and netted with russet and with minute greenish, irregular specks; flesh white, moderately juicy, half fine-grained, buttery, nearly melting, with a sweet vinous flavor; quality good. Season early October; young wood yellowish-brown. The trees seem quite productive, and the size and quality of the fruit make it desirable either for market or home use.

**Seckel.** Trees fairly strong, conical, healthy, hardy. Fruit small to medium, obovate, sometimes slightly pyriform; stalk one-fourth to one inch in length, stout, slightly curved; cavity none; calyx open, segments erect, in a narrow, very shallow basin; color dull yellowish-brown, often covered with smooth cinnamon russet, and generally with a dark brownish red cheek; flesh white, juicy, tender, melting, buttery, with a rich, sweet, vinous flavor; quality very good. Season October. Young wood olive brown. The trees are generally productive and when the fruit is well grown, even though at best it is of but medium size, its handsome appearance and high flavor, make it one of the best dessert pears.

**Sheldon.** Trees quite vigorous, erect and hardy, with large, thick, glossy leaves. Fruit large, roundish obtuse, obovate; stalk three-fourths inch long, in a rather deep cavity; calyx open, segments partly recurved, in a large, broad basin; color greenish yellow, mostly covered with thin light russet, and a little brownish-crimson in the sun, and with many russet dots; skin rather thick, harsh; flesh whitish, very juicy, melting, with a sweet, vinous, rich and aromatic flavor; quality quite good. Season middle to last of October. Young wood yellowish brown. Trees generally productive and although not especially desirable for market purposes, it is one of the best kinds for home use.

**Souvenir (du Congres.)** Trees fairly vigorous, generally spreading. Fruit large to very large, obovate, obtuse, pyriform; stalk three-fourths inch long, very stout, much inclined; cavity none; calyx open, with reflexed segments, in a shallow, medium sized basin; color a handsome

yellow at maturity, washed with bright red or carmine in the sun and brownish dots, russeted at the stem; flesh white, rather coarse, slightly perfumed, vinous; quality good. Season last of September and early October.

**Sterling.** Trees vigorous, upright. Fruit medium to large, nearly round, slightly turbinate; stalk one to one and one-fourth inches long, inclined, curved; cavity small or none, sometimes lipped; calyx open, in a broad, shallow basin; color yellow, netted with brownish russet and with a brilliant crimson cheek; flesh white, juicy, fine grained, crisp and melting, with a sweet flavor; core closed, medium; quality good. Season last of August and first of September; twigs light yellowish brown. A valuable market variety.

**Victor.** Trees upright. Fruit quite large, obtuse pyriform; stalk one and one-fourths inches long, slender; cavity none; calyx very small, closed, in a moderately deep, slightly irregular basin; color clear, light yellow, with many greenish specks; flesh creamy white, granular, tender, melting, buttery, with a sweet, highly aromatic flavor; quality quite good. Season middle to last of October. If sufficiently productive, it is likely to prove a valuable variety, either for dessert or market purposes.

**Winter Nelis.** Trees fairly strong, but very irregular and straggling in growth. Fruit medium size, varying from obovate to pyriform; stalk moderately stout, one and one-fourth inches long, in a small, narrow cavity; calyx open, segments nearly upright, in a broad, moderately deep basin; color yellow, more or less covered with blotches and spots of dark cinnamon russet; core closed, seeds few, long, ovate, pointed; flesh white, juicy, tender, melting, buttery; of a rich, sweet, aromatic flavor; quality very good. Season October to January. Young wood moderately stout, dark reddish brown.

**Zache.** Trees very vigorous, quite upright. Fruit large, roundish oblate; stalk one and one-fourth inches long, stout, slightly inclined, in a narrow, deep, regular cavity; basin wide, very deep, varying to narrow and shallow in some specimens; calyx lobes generally dropped; color orange at maturity, with a pinkish tinge, and with many light yellowish dots and specks; surface generally roughened; flesh rather dry, coarse, crisp and granular, with a sweet, slight pine-apple flavor; quality very poor. Season November to December. Foliage very large, glossy. In young trees the branches are very large and with numerous yellow spots on the olive-green bark. The coarseness and poor quality of the fruit renders it of no value although the trees are early and profuse bearers.

## PLUMS.

After the plums were pruned in the early spring, they were given the same application of fungicides as the pears, and although this treatment usually suffices to save the crop from the plum curculio when a large number of fruits set, the comparatively light setting of some varieties made jarring desirable. This was done at intervals from the 1st to the 15th of June, and while the curculio seemed quite numerous at first, the number found later on was very small. Considerable trouble was experienced from the work of the aphid upon the foliage, but a thorough spraying with kerosene emulsion proved effectual in destroying them.

On the 12th of August, when the weather was extremely dry, the foliage of some of the trees that were bearing heavy crops of fruit began to wilt and from one to two barrels of water were placed in a basin about each tree. As soon as the water had soaked away, the soil was replaced and on the following morning the foliage and fruit were found to have resumed their former plumpness, and the plums developed to their full size at the proper time.

## EUROPEAN PLUMS.

**Agen Prune.** Tree quite vigorous and of a dense, roundish, upright form. Fruit oval; stalk one inch long, slender; cavity very slight and narrow; apex scarcely perceptible; suture indistinct; color dark purple, nearly black, with a medium, bluish bloom; flesh juicy, pale green, very firm and tender with a mild, vinous flavor; pit small, oval, flattened, free. It has shown itself thus far, somewhat lacking in productiveness. Ripe August 9; weight two-thirds of an ounce. Young wood is smooth, dark brown in color.

**Arch Duke.** Tree quite vigorous, upright. Fruit roundish, slightly oval; stalk one-half inch long, slender; cavity imperceptible; apex indistinct; suture broad, shallow, more than one-half around; color black, with a dense light blue bloom; flesh juicy, pale amber, tender, rather acid; pit rather small, oval, pointed, flat, free; quality medium; size large. Young wood reddish brown.

**Arctic.** Tree rather vigorous, with an upright, round head, and with branches somewhat spreading. Fruit roundish, oval; stalk three-fourths inches long, slender; cavity very slight; apex hardly noticeable; suture indistinct; color black, with a thin, blue bloom; flesh tender, juicy, yellowish amber, very firm, nearly sweet; pit small, oval, nearly free. Season August 16; size medium. A hardy and generally productive variety, but the fruit is much too small for market purposes.

**Aubert Yellow.** Tree quite vigorous, upright. Fruit oval to ovate; stalk stout, one inch long, inserted within a fleshy ring; cavity narrow, slight; apex indistinct; suture not very distinct; color rich clear yellow, with a slight whitish bloom; flesh juicy, yellow, quite firm, but tender, rich and sweet; pit long, oval, pointed, cling; quality good. Generally quite productive. Season August 30; fruit large. One of the most promising of the yellow varieties.

**Bavay.** Tree rather vigorous, upright, but with its branches slightly spreading. Fruit roundish; stalk three-fourths of an inch long, medium size; cavity broad, shallow; apex unmarked; suture very slight; color dull greenish-yellow, with a thin, whitish bloom; flesh very juicy, of a pale, dull yellow, quite firm, sweet, rich, delicate; pit oval, cling; quality very good. Season September 29. Fruit medium to large. This variety is often sold under the name of Green Gage, which is of smaller size and ripens several weeks earlier. The fruit of Bavay nearly equals that of the true Reine Claude, and is superior to that variety in the vigor and productiveness of the trees.

Tabulation of *Pyrus*—*Pyrus*—1898.

Abbreviations—Form: l, long; o, oval; ob, obovate; r, roundish. Color: b, black; g, greenish; p, purple; r, red; w, whitish; y, yellowish. Adhesion: c, cling; f, free; s, semi-cling.

Number.	Names.	Species.	Planted.	Vigor— scale 1-10.	Bloomed.	Ripened.	Form.	Color.	Adhesion.	Weight of spec- imen in ounces.	Productiveness scale 1-10.	Quality— scale 1-10.
1	Abundance	Triflora	1898	6	Apr. 28.	Aug. 6.	r o	r	c	1	10	50
2	Agon Prune	Domestica	1890	10	May 2.	" 9.	r o	p	c	2	few	67
3	Archduke	Domestica	1892	9	" 2.	" 9.	r o	b	c	1	few	84
4	Arctic	Domestica	1890	10	" 7.	" 10.	r o	b	c	1	7	10
5	Bary	Domestica	1890	10	Apr. 30.	Sept. 29.	r	g y	c	1	7	10
6	Black Diamond	Domestica	1892	10	" 30.	" 8.	o	b	c	2	7	50
7	Botan	Triflora	1890	8	" 27.	Aug. 8.	r o	r	c	1	50	50
8	Bradshaw	Domestica	1890	9	May 7.	" 20.	r o	r p	c	2	1	67
9	Burbank	Triflora	1898	10	Apr. 28.	" 4.	r	y r	c	1	10	6
10	Burbank 2 (is Abundance)	Triflora	1890	9	May 3.	" 10.	r o	r	c	1	10	50
11	Coe	Domestica	1898	9	" 5.	Sept. 29.	o	y	c	2	few	8
12	Columbia	Domestica	1898	8	" 10.	Aug. 23.	r	p	c	1	2	78
13	Csar	Domestica	1898	9	" 6.	" 8.	r o	p	c	1	2	78
14	Engle	Domestica	1890	9	" 8.	" 8.	r o	y g	c	1	4	78
15	Englebert	Domestica	1890	10	" 2.	Sept. 8.	r o	b	c	1	4	67
16	G. No. 4	Domestica	1890	10	" 5.	Aug. 11.	r	p	c	1	1	78
17	Grand Duke	Domestica	1890	10	Apr. 30.	Sept. 9.	o	p	c	1	2	50
18	Gull	Domestica	1890	8	May 9.	Aug. 24.	r	p	c	1	1	50
19	Hungarian	Domestica	1898	10	" 2.	" 24.	r	p	c	1	8	67
20	Kingston	Domestica	1890	10	" 2.	" 24.	o	p	c	2	8	67
21	Lincoln	Domestica	1890	10	" 7.	" 10.	r o	r p	c	2	2	8
22	Lombard	Domestica	1891	8	" 7.	" 12.	r	p	c	1	4	8
23	Long Fruited	Triflora	1890	10	" 8.	July 16.	r	p	c	1	8	28
24	Mariana	Cerasifera	1890	10	" 9.	Aug. 10.	o	r	c	1	8	28
25	Maru	Triflora	1890	8	" 8.	Aug. 28.	r	r	c	1	few	68
26	McLaughlin	Domestica	1898	7	" ?	Sept. 29.	r o	g y r	c	2	1	10
27	Middleburg	Domestica	1890	10	May 3.	" 18.	r o	y p	c	2	8	8
28	Monarch	Domestica	1898	9	" 2.	" 23.	o	p	c	1	8	7
29	Moreman (very small this year)	Domestica	1890	9	" 14.	July 26.	oblo	p	c	1	1	6
30	Nicholas White	Domestica	1890	9	" 9.	Aug. 28.	r o	p	c	1	1	50
31	Ogon	Triflora	1890	10	" 2.	July 26.	r	y	c	1	1	28
32	Red June	Triflora	1894	10	Apr. 30.	Aug. 10.	r o	r p	c	1	10	28
33	Red Nagata	Triflora	1890	8	May 4.	" 30.	r o	r	c	1	8	50





**Bradshaw.** Tree quite vigorous, upright, slightly spreading. Fruit oval or obovate; stalk one inch long, rather stout, curved; cavity small; apex slightly sunken; suture one-half around, broad, shallow; color reddish purple; bloom light blue; flesh juicy, yellowish, coarse, brisk, pleasant; pit semi-cling; ripe August 20; size large; quality good. Generally quite productive, and a valuable early variety. As a market sort, its principal fault is that it is subject to the attack of the brown rot.

**Coe, Golden Drop.** Tree rather vigorous, roundish, upright. Fruit oval and with a slight neck, and with one side often enlarged; stalk three-fourths to one inch long, slender; cavity none, but with a close ring; apex pointed, in a shallow suture; suture more than one-half around; color yellow, with a light, white bloom; flesh light amber, or greenish-white, rather firm and with a sprightly, vinous, rich flavor; pit small, oval, pointed, plump, cling; quality good. Ripe September 23; fruit large; young wood purple. Although in some sections it is found productive, its principal fault seems to be a lack of productiveness.

**Columbia.** Tree rather strong, with an upright habit, and slightly spreading branches. Fruit nearly globular, with one side larger than the other; stalk three-fourths to one inch long, medium; cavity narrow, small; apex in a depression; suture very distinct, one-half around; color reddish brown on the shaded side, with a brownish purple in the sun, and dotted with fawn-colored specks, and covered with an abundant blue bloom; flesh rather dry, yellowish amber in color, firm, very rich, sugary, excellent; pit quite small, compressed, nearly free. The trees are as yet too young to determine their fruitfulness, but it seems to be a promising variety for dessert purposes. Season August 23; size medium to large.

**Czar.** Tree quite vigorous and of an upright habit. Fruit roundish ovate; stalk one-half inch long, rather slender; cavity regular, narrow; apex slightly sunken; suture a mere line, one-half around; color dark purple, with a light blue bloom; flesh moderately juicy, pale amber, firm, sweet, vinous, very pleasant; pit free; quality good; season August 4; size medium to large. Thus far somewhat lacking in productiveness; shoots stout and with shouldered buds.

**Diamond, Black.** Tree quite vigorous, upright, with its branches somewhat spreading; fruit oval, with one side generally enlarged; stalk five-eighths inches long, stout; cavity narrow; apex scarcely noticeable; suture slight; color black with a dense bluish white bloom, flesh moderately juicy, pale amber, firm, with a pleasant, vinous flavor; pit long, oval, pointed, and with a very slight adherence; quality good. Season September 8; fruit quite large and generally quite productive. Although evidently distinct, this variety is quite similar to Kingston.

**Englebert.** Tree strong growing, with a dense upright, roundish head. Fruit roundish, oval; stalk one-half inch long, stout; cavity none; apex sunken; suture distinct towards the apex; color black with a plentiful blue bloom; flesh juicy, amber, sweet, rather rich; pit small, oval, free; quality good. Season September 8; size medium, moderately productive. Young wood smooth.

**Field.** Tree quite productive, with an upright head but with slightly spreading branches. Fruit oval, regular; stalk one inch long, moderately stout; cavity narrow, slight; apex indistinct; color black with a thin blue bloom; flesh tender, moderately juicy, pale amber, quite firm, mild; pit cling; quality good. Season August 24; size large. In tree and

fruit resembling Bradshaw, but slightly earlier and with somewhat smaller fruits than those of that variety.

**French Damson.** Tree quite vigorous, with a dense roundish or slightly upright head; fruit roundish, inclined to oblong; stalk one-half inch long, slender; cavity very slight; apex indistinct; suture hardly perceptible; color black, with numerous gray specks and with a slight blue bloom; flesh juicy, pale, dull green, firm, sweet; pit small, flattened, roundish, oval, cling; quality good. Season September 18; size small. Thus far lacking in productiveness. Young wood slender, brownish.

**Giant Prune.** Trees moderately vigorous, upright or slightly spreading, with very stout branches. Fruit ovate, slightly necked; stalk one-half inch long, stout; cavity none; apex indistinct and suture well marked one-half around; color dark purple, specked with many yellowish dots; bloom slight, bluish; flesh juicy, amber colored, tender, sweet, pleasant; pit long, oval, pointed, nearly flat, free; quality good. Season September 20; size large. Trees too young to give an idea of their probable productiveness.

**Glass.** Tree very vigorous, with strong, upright branches and slightly spreading shoots. Fruit oval; stalk one-half inch long, stout; cavity broad and deep; apex slightly depressed; suture shallow; color purplish black, with an abundant blue bloom; flesh moderately juicy, pale amber, firm, fine grained, mild, pleasant; pit plump, roundish, oval, cling. Season August 10; size large; young wood smooth, dark reddish brown. One of the most satisfactory trees in the plantation and it promises to be a productive variety.

**Grand Duke.** Tree moderately vigorous, upright, with spreading branches. Fruit ovate, tapering towards the stalk, which is one inch long, stout; cavity narrow, shallow; apex distinct, suture well marked; color black with a dense blue bloom; flesh juicy, pale yellowish orange, firm, vinous; pit oval, rather plump, cling; quality good. Season September 1; size large to very large; young wood rather stout; generally quite productive. One of the best of the large late sorts.

**Guil.** Tree quite vigorous, spreading, upright. Fruit roundish, slightly ovate; stalk one-half inch long, rather slender; cavity narrow, slightly depressed; suture scarcely perceptible; color dark brown, nearly black with a slight bluish bloom; flesh juicy, light amber, tender, sweet; pit small, oval, pointed, free; quality very good; season August 24; size large; generally quite productive; young wood reddish brown. One of the most valuable varieties of its season.

**Hungarian.** Tree quite vigorous, with a round, upright head. Young wood reddish brown. Fruit roundish; stalk one-half inch long, stout; cavity medium size, rather deep; apex often slightly depressed; suture very slight; color dark purple or black, with an abundant blue bloom; flesh juicy, tender, light amber, quite firm, mild, pleasant; pit plump, roundish, oval, free; quality good. Season August 20; size medium to large; quite productive.

**Kingston.** Tree quite vigorous, roundish upright, spreading. Young wood stout, grayish brown. Fruit oval; stalk three-fourths inches long; cavity narrow, rather deep; apex prominent; suture distinct, one-half around; color black with a dense bluish-white bloom; flesh juicy, tender, light amber, sprightly; pit long, oval, cling; quality good; season August

31; size large to very large. An early and abundant bearer, and a valuable variety for market purposes.

**Lincoln.** Tree quite vigorous, roundish, spreading, with an upright growth; young wood grayish-brown. Fruit roundish oval; stalk one inch long; cavity narrow, shallow; apex sunken; suture slight, extending one-half around; color pale reddish violet, profusely sprinkled with brown specks and with a fine bluish-white bloom; flesh rather fine grained, moderately juicy, pale amber, rather firm, tender, very mild, sub-acid, pleasant; pit rather large, oval, flat, free; quality quite good. Season August 10; size large to very large. A strong growing and productive variety that appears to be promising for either home use or market, if its tendency to rot can be controlled.

**Lombard.** Tree quite vigorous, with an upright, spreading habit. Fruit roundish, slightly oblong; stalk five-eighths inches long; cavity narrow and deep; apex slightly depressed; suture scarcely perceptible; color violet-purple, with a pale blue bloom; flesh juicy, yellow, tender, mild, pleasant; pit rather large, oval, pointed, plump, cling; quality good. Season August 22; size medium to large; generally very productive. A valuable variety for home use, but it has been extensively planted so that all of the large markets are overstocked, and it has not been a valuable shipping sort for some years. In some sections it is being top-worked with Monarch and other large late sorts.

**Lyon, Bailey.** Trees upright, spreading, quite vigorous; young wood of a reddish brown. Fruit round or slightly oval; stalk one inch long, moderately stout; cavity narrow, slight; apex depressed, suture slight one-half around; color bright, clear yellow with a slight bloom; flesh moderately juicy, yellow, tender, rich, sweet, vinous; pit large, oval, plump, nearly free; quality quite good. Season September 1; size large; generally quite productive. A promising variety brought to notice by S. S. Bailey of Grand Rapids, Mich., and re-named by the Michigan Horticultural Society.

**McLaughlin.** Tree moderately vigorous. Fruit roundish oval; stalk three-fourths inches long, slender; cavity narrow, small; apex indistinct; suture scarcely perceptible; color greenish yellow, with stripes and specks of dark red, and with a whitish bloom; flesh very juicy, clear yellow, tender, rich, sweet, excellent; pit small, semi-cling. Season September 29; size large. A plum of the highest quality, and promising for market if sufficiently productive.

**Middleburg.** Tree quite vigorous, upright, with rather spreading branches. Fruit roundish oval; stalk one to one and one-half inches long, stout; cavity broad, slight; apex indistinct; suture unmarked; color greenish yellow, nearly covered with reddish-brown and with a purplish color on the exposed side; bloom thin, light blue; flesh moderately juicy, light amber, rather firm, vinous, sprightly, rich; pit small, nearly round, free; quality very good. Season September 18; size medium; fairly productive.

**Moldavka.** Rather vigorous, upright, spreading. Fruit long, ovate; stalk stout, one inch long; cavity rather deep, abrupt; apex obscure; suture indistinct one-half around; color pale yellow, with a scarcely perceptible bloom; flesh moderately juicy, pale yellowish amber, moderately firm, mild, pleasant; pit long, ovate, pointed, flat, free; quality good.

Season September 1; size large. A handsome fruit, but the tree has shown itself to be but moderately productive.

**Monarch.** Tree quite vigorous, upright; young wood slightly red. Fruit ovate, compressed, with one side somewhat enlarged; stalk seven-eighths inches long, medium size; cavity rather deep and narrow; apex scarcely perceptible; suture broad, shallow; color deep purple, almost black, with a moderate blue bloom; flesh moderately juicy, light yellowish amber, rather firm, mild, vinous, sweet; pit long, oval, rather plump, with a slight adherence; quality quite good. Season September 22; size quite large. One of the most promising varieties for market purposes.

**Murdy.** Tree strong growing, upright. Fruit roundish, oval; stalk three-fourths inches long, stout; cavity narrow, rather deep; apex imperceptible; suture slight one-half around; color reddish purple with many yellowish dots and specks and a light blue bloom; flesh moderately juicy, amber, tender, sweet, vinous, rich; pit oval, pointed, moderately plump, cling; quality very good. Season September 16; size large; as yet rather unproductive, but if this quality develops, it bids fair to become a valuable market sort.

**Nicholas White.** Tree quite strong, roundish, upright. Fruit roundish to roundish oval; stalk three-fourths inch long; cavity small; apex quite distinct; suture very slight; color purple, numerously sprinkled with small yellowish dots, and with an amber, bluish bloom; only moderately juicy, pale amber, firm, vigorous, sprightly, rather rich; pit large, oval, plump, cling; quality good. Season August 22; size medium to large. Appears to be lacking in productiveness.

**Saratoga.** Tree very vigorous, upright, slightly spreading; young wood olive brown; fruit oval, roundish; stalk one inch long, moderately stout; cavity narrow, deep; apex generally slightly depressed; suture indistinct two-thirds around; color dull dark red or purple, violet in the shade, profusely sprinkled with minute grayish dots, bloom thin, lilac; flesh tender, juicy, dull yellow or pale amber, moderately firm, mild subacid, pleasant; pit oval, pointed, cling; quality good. Season August 12; size large. As yet not very productive.

**Shipper Pride.** Trees quite vigorous, roundish, upright. Fruit medium size, oval, with one side slightly enlarged; cavity rather broad and shallow; stalk stout, three-fourths inch long; apex indistinct; suture well marked; color black with a plentiful blue bloom; flesh juicy, quite firm, of an amber color, and with a sweet, pleasant and sprightly flavor; pit rather large, pointed, moderately plump, cling; quality good; season August 23; moderately productive; young wood reddish brown, twigs coarse. Although a good shipping sort, the small size and firmness of the fruit make it of little value.

**Shropshire Damson.** Trees vigorous with a dense upright head. Fruit small, although large for the Damson, roundish, oval; cavity none; stalk medium size, three-fourths inch long; apex scarcely perceptible; suture very slight; color black with a blue bloom; flesh juicy, tender, pale green, high flavor; pit small, oval, pointed, a partial cling; quality poor; generally quite productive; season September 20. Valuable for market and culinary purposes.

**Spanish.** Trees quite vigorous, rather upright; fruit medium to large, roundish, slightly inclined to oval; cavity narrow, deep, stalk stout, five-eighths inch long; apex and suture hardly marked; color reddish

purple, with a bluish bloom; flesh firm and juicy, light amber, with a mild, vinous, nearly sweet flavor; pit medium size, oval, cling; quality fair; quite productive; season August 25; young wood reddish brown. Although rather small, it may have some value as a market sort.

Spaulding. Trees vigorous, with a roundish, upright head. Fruit medium to large, nearly oval; cavity medium size, shallow; stalk three-fourths inch long, medium size; apex indistinct; suture distinct one-half around; color yellowish green, faintly mottled with a slight whitish bloom; flesh tender, moderately juicy, amber with a sweet, sprightly, pleasant flavor; pit cling; quality good; season September 1. The trees are small, and as yet are somewhat lacking in productiveness, but it appears to be a promising variety for home use and possibly for market.

Victoria. Trees quite vigorous, upright, with spreading branches. Fruit medium to large with one side much enlarged; cavity narrow, slight; stalk rather stout, one inch long; apex scarcely perceptible; suture deep, one-half around; color violet red, with numerous yellowish gray dots and specks, and with delicate lavender bloom; flesh moderately juicy, firm, pale yellowish amber, with a mild, nearly sweet flavor; pit oval, flat, free; quality good; season August 20; quite productive; young wood reddish brown. A promising variety for dessert purposes, but not likely to become a valuable market sort. The fruit has rotted badly for several years.

Wangenheim. Trees quite vigorous, with a roundish, upright head, and somewhat spreading branches. Fruit medium size, ovate, slightly enlarged on one side; cavity small, shallow; stalk slender, one-half inch long; apex and suture hardly noticeable; color black, with abundant blue bloom; flesh very firm, tender, moderately juicy, sweet, amber colored; pit small, oval, free; quality fair; season August 25; fairly productive. The small size of the fruit renders it of little promise.

Yellow Egg. Trees quite vigorous, upright, slightly spreading. Fruit medium to large, oval, with one side slightly enlarged; cavity not marked; stalk stout, one inch long; apex slightly sunken, with a well defined suture one-half around; color pale yellow, with numerous white dots and a slight whitish bloom; flesh coarse, tender, moderately juicy, of a yellow color and a sweet, vinous flavor; pit oval, plump, small, cling; quality fair; season September 15. Generally quite productive and a fairly valuable variety for market or culinary purposes.

#### JAPANESE PLUMS.

Abundance. Tree quite vigorous, upright in growth. Fruit roundish, narrowing towards the apex; stalk one-half to three-fourths inch long, quite stout; cavity small, moderately deep; suture very marked, one-half around; apex prominent; color reddish purple at maturity; with a plentiful light lilac bloom; flesh juicy, yellow, tender, pleasant and mild; pit plump, oval, clinging; ripe August 8; weight two-thirds ounce; very productive; quality good; young wood rather slender, of a dark reddish brown. An early bearing productive sort, and although it flowers early, it is one of the hardiest of the Japanese varieties.

Botan. Tree rather vigorous, spreading. Fruit roundish, narrowing towards the apex; stalk one-half inch long, stout; cavity medium size, open; apex quite prominent; suture distinct; color reddish purple, thickly

sprinkled with yellowish dots and specks; bloom moderate, light lilac; flesh very juicy, bright yellow, tender, mild, pleasant; pit small, oval, quite plump, cling; quality good; ripe August 8; size medium to large. Generally quite productive.

**Burbank.** Tree quite vigorous, very spreading. Fruit roundish, tapering slightly towards the apex; stalk three-fourths inch long; cavity broad and deep; apex prominent; suture a mere line; color dark red on a yellow ground, with a slight whitish bloom and numerous yellow specks; flesh juicy, pale orange, tender, mild, vinous, pleasant; pit cling. Generally very productive. Ripe August 4; size quite large; young wood dark olive. Owing to the size and productiveness of this variety, it is one of the most valuable of the Japanese plums for home use or for market purposes.

**Burbank No. 2.** Tree moderately vigorous, upright in habit, with slightly spreading branches. Fruit roundish; stalk three-eighths inch long, stout; cavity slight; apex prominent; suture distinct, one-half around; color dark red, with a profuse sprinkling of yellowish specks; bloom delicate lilac, plentiful; flesh juicy, tender, yellow, firm, with a sprightly and rich flavor; pit small, oval, cling; quality rather good. A productive variety, ripening August 10. Fruit medium to large. Young wood rather slender, of a glossy reddish brown.

**Burbank No. 7.** Tree rather vigorous with a round head, and with upright or slightly spreading branches. Fruit roundish, oblong; cavity narrow, deep; apex slightly sunken; suture broad, shallow; color greenish yellow, bloom bluish white; flesh juicy, pale yellow, rather firm, mild and vinous; pit plump, roundish oval and semi-cling; quality good. Season September 15. Fruit medium to large. An early productive variety.

**Maru.** Tree quite vigorous, upright, spreading. Fruit nearly round, but with a slight conical form; stalk one and one-half inches long, rather stout; cavity rather broad and deep; apex an enlargement at the end of the suture; suture not distinct, but the fruit is slightly uneven; color dark red, with a slight lavender; flesh juicy, orange yellow, moderately firm and vinous; pit round, plump, cling; quality fair. Season August 23; size medium, generally quite productive. Its comparatively small size and inferior quality make it less valuable than Burbank and some of the other Japanese sorts.

**Ogon.** Tree strong growing, rather upright; fruit round; stalk one-half inch long, stout, separates readily from fruit; cavity narrow, shallow; apex even with surface; suture one-half around, indistinct; color pale yellowish white with a slight whitish bloom; flesh firm, juicy, pale yellow or amber, tender with a sweet but slightly unpleasant flavor; pit free; quality rather poor. Season July 26; size medium to large. A profuse bearer but too poor in quality and too unattractive to become popular.

**Red June.** Tree quite vigorous, upright. Fruit roundish to roundish ovate; stalk one-half inch long, stout, generally remains on the spurs; cavity shallow, regular; apex prominent, slightly conical; suture distinct more than one-half around; color dark reddish purple, with many yellow dots and a light lilac bloom; flesh yellow, fine grained, tender, juicy, mild, rich, sweet, very good; pit rather small, oval, moderately plump, quite

firm; quality good. Season August 10; size large to very large. A very promising variety either for home use or market.

**Red Nagate.** Quite vigorous with a roundish, upright head. Fruit roundish, ovate, tapering towards the apex; stalk one-half inch long, stout; cavity rather broad and deep; apex not distinct; suture well marked one-half around; color dark, dull red, with minute yellow specks; bloom light, lilac; flesh very juicy, yellow, tender, sweet; pit small, oval, plump, cling; quality good. Season August 20; size large to very large, quite productive. Resembles Red June in most respects, but it seems to be ten days later.

**Satsuma.** Trees quite vigorous, somewhat upright but with spreading branches. Fruit large, roundish, with one side enlarged; cavity medium; stalk five-eighths inch long, stout; apex distinct, conical; suture distinct; color dark purplish red, with many minute yellowish specks and a slight pinkish bloom; flesh dark purple, tender, juicy, with a mild, vinous flavor; pit small, oval, moderately plump, cling; quality good; ripe August 20; quite productive; young wood brownish red. One of the most desirable varieties for canning purposes.

**Shiro Smomo.** Trees quite vigorous with a roundish head. Fruit small, roundish, ovate, with one side slightly enlarged; cavity broad and rather deep; stalk one-half inch long; apex prominent; suture distinct one-half around; color dark purple with a slight bluish white bloom; flesh fine grained, tender, moderately juicy, whitish yellow; pit cling; quality fair; season July 28; fairly productive. Although a very early variety, the small size of the fruit renders it of little value.

**Wickson.** Trees fairly vigorous, upright, with small, narrow foliage. Fruit very large, roundish, conical, tapering to the apex, which is prominent; cavity rather narrow, deep, regular; suture distinct one-half around, one side of the fruit enlarged; color deep yellowish amber, with splashes of red over most of the surface, except at the tip; flesh quite firm, moderately juicy, with a very pleasant, vinous flavor; color of flesh yellow; pit ovate, flattened, cling; season August 18. The young trees seem to be hardy and quite productive, and although the fruit is not of the highest quality, its large size and handsome appearance tend to make it a very promising variety.

**Yosebe.** Trees quite strong growing, with an upright, round head and somewhat spreading branches. Fruit small, roundish, with a narrow cavity and a short, stout stalk, from which the fruit usually drops, leaving it on the trees; apex rather prominent, with a distinct suture one-half around; color reddish brown, with numerous amber specks and a very fine lilac bloom; flesh firm, moderately juicy, light amber, with a mild but bitter flavor; pit small, oval, semi-cling; quality rather poor; season July 15. The small size and inferior flavor of the fruit make it of little value, its only claim being on account of its extreme earliness.

L. R. TAFT.  
T. T. LYON.

Agricultural College, Mich., February 1, 1899.

**BULLETINS 170-171.**

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# MICHIGAN

## STATE AGRICULTURAL COLLEGE

# EXPERIMENT STATION

HORTICULTURAL DEPARTMENT.

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170. Vegetable Tests for 1898.

171. Bush Fruits for 1898.

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BY L. R. TAFT, H. P. GLADDEN AND M. L. DEAN.

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AGRICULTURAL COLLEGE, MICHIGAN  
1899





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## VEGETABLE TESTS FOR 1898.

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BY L. R. TAFT, H. P. GLADDEN AND M. L. DEAN.

A large number of new varieties of vegetables are sent out each year. We have continued the practice of former years of securing seeds and testing their merits. In some cases we have been able to obtain them from the originators before they had been placed upon the market, but, for the most part, have had to secure them from the seedsmen by whom they are being introduced. While there has been considerable change in the varieties grown to-day as compared with those in cultivation ten years since, the difference is greater in the names than in the varieties themselves, as in many cases, although the name has been changed, a careful trial of many of these varieties shows that they are nothing more than improved strains of some of the old kinds. The change that has been brought about has been secured largely by selection, and if it is sufficiently marked to make any difference in the value of the variety, the seedsmen are justified in applying a new name to it. Particular attention is called to the results secured from the use of a number of fungicides as preventives of the scab upon potatoes.

### BUSH BEANS.

The following sorts have not been described in previous bulletins:

*California Wonder.* From Northrup, King & Co., Minneapolis, Minn. Plants of low, straggling growth, with light green foliage. Edible August 5. Pods four to four and one-half inches long, straight, flattened and green in color; their quality is excellent and they remain a long time in edible condition. The variety is very productive of pods but late in maturing.

*Dwarf Lyonnaise.* From J. M. Thorburn & Co., New York. Plants of strong, upright growth and foliage of dark green color. Edible August 5. Pods six to seven inches long, green, twisted and curved, very tender, snappy, and sweet in quality. The plants were unproductive and the variety late in maturing edible pods.

*Earliest Hardest.* T. W. Wood & Sons, Richmond, Va. Plants are of small, unhealthy growth. Foliage light green in color and badly rusted. Edible July 22. Pods are five to six inches long, narrow and flattened, green in color. The quality is good, but the plants were so weak in growth that very few pods were borne.

*Jones Round Pod Wax.* From Jas. Vick's Sons, Rochester, N. Y. Edible July 22. Pods four to six inches long, curved, greenish yellow in color. The quality is high and the variety is early in maturing. A good yellow-podded sort.

*Jones Stringless.* From D. M. Ferry & Co., Detroit, Mich. Edible July 23. Quite similar to preceding but much more productive, and the pods are of a golden yellow color and the beans are larger and more nearly round. A most excellent wax bean for its high quality, productiveness and long season.

*Bush Beans, Planted May 31.*

Variety.	Seedsman.	Date edible.
Black Valentine.....	Peter Henderson & Co., New York.....	July 23
California Wonder.....	Northrup, King & Co., Minneapolis, Minn.....	Aug. 5
Crystal White Wax.....	H. W. Buckbee & Co., Rockford, Ill.....	July 28
Cream Valentine.....	Peter Henderson & Co., New York.....	" 22
Cylinder Black Wax.....	Peter Henderson & Co., New York.....	" 28
Davis Wax.....	D. M. Ferry & Co., Detroit, Mich.....	" 26
Detroit Wax.....	D. M. Ferry & Co., Detroit, Mich.....	" 23
Dwarf Horticultural.....	W. W. Rawson & Co., Boston, Mass.....	" 26
Dwarf Lyonaise.....	J. M. Thorburn, & Co., New York.....	Aug. 5
Earliest Hardest.....	T. W. Wood & Sons, Richmond, Va.....	July 22
Electric Tree.....	H. W. Buckbee & Co., Rockford, Ill.....	Aug. 18
Goddard.....	D. M. Ferry & Co., Detroit, Mich.....	July 28
Golden Wax.....	D. M. Ferry & Co., Detroit, Mich.....	" 21
Improved Goddard.....	D. M. Ferry & Co., Detroit, Mich.....	" 23
Jones Round Pod Wax.....	Jas. Vick's Sons, Rochester, N. Y.....	" 22
Jones Stringless.....	D. M. Ferry & Co., Detroit, Mich.....	" 23
Mohawk.....	D. M. Ferry & Co., Detroit, Mich.....	" 22
No. 1.....	Peter Henderson & Co., New York.....	" 20
Rogers' Lima Wax.....	H. W. Buckbee & Co., Rockford, Ill.....	Aug. 1
Stringless Green Pod.....	W. Atlee Burpee, Philadelphia, Pa.....	July 22
Stringless Valentine.....	Johnson & Stokes, Philadelphia, Pa.....	" 25
Triumph of the Frames.....	H. A. Dreer & Co., Philadelphia, Pa.....	" 28
Valentine Wax.....	D. M. Ferry & Co., Detroit, Mich.....	" 21
Valentine Wax.....	Sunset Seed Co., San Francisco, Cal.....	" 21
Yosemite Mammoth Wax.....	Sunset Seed Co., San Francisco, Cal.....	" 28

*No. 1.* From Peter Henderson & Co., New York. Plants of strong, healthy growth. Edible July 20. Pods seven to eight inches long, broad and flattened, dark green in color, tender and of excellent quality. The plants are very productive. It was the earliest variety to mature edible pods. A most valuable green-podded bean.

*Rogers' Lima Wax.* From H. W. Buckbee & Co., Rockford, Ill. Plants of low, stocky growth. Edible August 1. Pods three to four inches long, straight, flattened, and of a rich golden yellow color. The variety is tender in pod and of very fine quality. It remains in edible condition a long time without becoming tough. The pure white beans are excellent for baking. The plants were scarcely productive enough, but otherwise it is a very promising variety.

*Stringless Valentine.* From Johnson & Stokes, Philadelphia, Pa. Plants of strong, healthy growth; foliage dark green. Edible July 25. Pods five to six inches long, round, nearly straight, dark green. It is not so early as Red Valentine, but the pods are less stringy and have a longer season. An excellent green-podded variety.

*Triumph of the Frames.* From H. A. Dreer & Co., Philadelphia, Pa. Plants are of weak growth and bear few pods. Pods are long, narrow, flattened, dark green, tender, juicy and of fine flavor, but are too thin and narrow for substance.

## SUMMARY OF VARIETIES.

The following wax sorts have given the best satisfaction here: *Cylinder Black Wax*, *Davis Wax*, *Golden Wax* and *Jones Stringless*. Among the better green podded sorts would be *Red Valentine*, *Stringless Green Pod* and *Stringless Valentine*.

## POLE BEANS.

The unusual exemption from early frosts, during the fall of 1898, gave an opportunity for some varieties of pole beans to mature that in ordinary seasons would not have done so in this locality.

*Black Lima*. A very productive variety, bearing small pods that contain three to four small, purplish-black beans. It usually does not mature before the plants are killed by frost.

*Challenger*. Plants of strong, vigorous growth and bear large pods that are filled with large, thick, white beans of good quality. An excellent market sort.

*Golden Cluster*. Perhaps the best pole bean for snap purposes. The large pods are tender, of very good quality and produced abundantly until the plants are killed by frost.

*Golden Lima*. While not so strong-growing as some, the plants are fairly productive and the pods contain from three to five large, golden yellow beans of very high quality. A fine variety.

*Holstein*. Of little value as a snap bean, but its productiveness and early maturity make a place for it as an early shell bean.

*Mastiff*. Much like *Golden Cluster*, but its season is a little later.

*Powell Prolific*. Plants of vigorous growth and very prolific. Pods green, very handsome in appearance, with solid flesh of the finest quality.

## Pole Beans, Planted June 7.

Variety.	Seedsman.	Date edible.
<i>Black Lima</i> .....	W. Atlee Burpee, Philadelphia, Pa.....	Sept. 28
<i>Challenger</i> .....	D. M. Ferry & Co., Detroit, Mich.....	" 6
<i>Golden Cluster</i> .....	D. M. Ferry & Co., Detroit, Mich.....	Aug. 19
<i>Golden Lima</i> .....	H. W. Buckbee & Co., Rockford, Ill.....	Sept. 8
<i>Holstein</i> .....	H. W. Buckbee & Co., Rockford, Ill.....	Aug. 15
<i>Mastiff</i> .....	J. J. H. Gregory, Marblehead, Mass.....	" 23
<i>Powell's Prolific</i> .....	A. W. Livingston's Sons, Columbus, Ohio.....	" 31
<i>Seibert's Early Lima</i> .....	D. M. Ferry & Co., Detroit, Mich.....	" 26
<i>Unnamed</i> .....	Frank Banning.....	" 26
<i>White Sickle</i> .....	D. M. Ferry & Co., Detroit, Mich.....	Sept. 2
<i>Willing's Pride</i> .....	John A. Salzer, LaCrosse, Wis.....	Aug. 22
<i>Willow Leaf</i> .....	W. Atlee Burpee, Philadelphia, Pa.....	Sept. 29

*Seibert Early Lima*. Plants strong growing and productive. Pods large, broad and contain three to four beans that are excellent in quality. One of the earliest and most valuable of the pole Limas.

*Unnamed*. The plants are not of tall growth, but are bushy and vigorous. Pods green, four to five inches long, straight, somewhat fuzzy, but of good quality when small. Productive and an excellent shell bean.

*White Sickle*. Much like *Old Homestead*, but the beans are white.

*Willing's Pride*. Pods are very long, green, tender and the quality is of the best. A good green-podded pole bean.

*Willow Leaf.* Plants of strong growth, unique in foliage and quite ornamental. Usually matures pods too late for ordinary seasons here.

### CABBAGE.

The seed of the early varieties of cabbage was sown March 15, in boxes in the forcing house; medium sorts April 25, and the late ones May 17. As soon as the plants were of proper size they were pricked out into flats, and were left in them till the proper time for transplanting to the field. The early varieties were put out May 17, the medium June 14 and the late sorts July 6.

The early and medium sorts were on rich, sandy loam, but the extremely hot weather of July and August would have ruined them had it not been for the use of the irrigating system. They were watered about the time the heads were starting and at intervals of five to eight days, as the condition of the weather required, until the heads were well developed. The late sorts were on reclaimed swampy land, and did not need irrigating.

The bacterial black rot of the cabbage attacked the late varieties quite badly, completely destroying several sorts and checking the growth of others to such an extent that it was impossible to find typical specimens for description or comparison.

The early varieties included a few that have not been described in the bulletins of 1896 and 1897.

Among the early varieties one might select All Head Early, Bullock Heart, the Wakefields, Early Spring and Early Summer, all of which gave a large percentage of heads, and were quick growers and of good quality.

*Paris Savoy*, from Vaughan, is a vigorous grower but can be planted

Table of varieties.

Variety.	Seedman.	Season.	Date.		No. of days from planting to maturity.	Per cent of plants headed.	Average weight of heads, pounds.
			First mature head.	Market maturity.			
All Head Early	Burpee	Early	July 28	Aug. 10	84	60	4.68
" "	Vaughan	"	" 28	" 10	84	75	5.3
Bloomsdale Bullock Heart	Landreth	"	" 30	" 12	92	80	5.8
Charleston Wakefield	Henderson	"	Aug. 3	" 12	92	98	3.5
Early Dwarf Flat Dutch	Landreth	"	July 28	" 5	79	61	2.33
" Jersey Wakefield	Henderson	"	" 28	" 8	82	77	5.1
" "	Vaughan	"	" 27	" 12	94	81	4.75
" Paris Savoy	Vaughan	"	" 29	" 14	96	81	3.5
" Spring	Vaughan	"	" 29	" 10	84	90	5.75
" "	Henderson	"	" 28	" 10	84	93	4.75
" Summer	Vaughan	"	" 28	" 10	84	94	4.5
Etampes	Vaughan	"	" 28	" 12	86	71	4.75
Queen	Buckbee	"	" 29	" 14	88	85	3.25
Solid South	Wood & Sons.	"	Aug. 4	" 16	90	80	4.5
Stein Flat Dutch	Vaughan	"	" 5	" 20	94	90	5.
Twiss Drumhead	Gregory	"	" 4	" 15	80	88	5.
Volunteer	Rawson	"	" 8	" 20	94	91	6.
Washington Wakefield	Northrup, King & Co.	"	July 28	" 10	84	82	4.75
All Seasons	Vaughan	Medium	Aug. 20	Sept. 4	101	98	5.1
Autumn King	Vaughan	"	" 30	Sept. 15	111	85	4.8
" "	Henderson	"	" 30	" 15	111	60	4.2
Market Gardeners' No. 2	Johnson & Stokes	"	" 30	" 10	111	90	4.7
Succession	Vaughan	"	" 18	" 1	99	95	6.3
" "	Henderson	"	" 18	" 1	99	90	4.4
Treasure	Everitt	"	" 30	" 15	111	75	3.
Vandergaw	Vaughan	"	" 25	" 6	106	80	3.5
Number 1	U. S. Dept.	"	" 20	Aug. 24	91	98	2.
" 2	" "	"	" 15	" 30	96	90	4.
" 3	" "	"	Sept. 10	Sept. 15	110	85	3.8
" 4	" "	"	" 1	" 20	109	95	4.4
" 5	" "	"	Aug. 20	" 1	101	98	4.6
" 6	" "	"	" 15	Aug. 25	96	50	2.5

closely. The heads are very compact, of a bright green outside, but the inner parts are of a rich cream color, and have a flavor hard to excel. The stem is of medium length, upright and stout. This is a valuable addition to the list of early cabbages for those who like the tender leaves and mild flavor of the Savoy.

*Queen*, one of the Buckbee novelties, promises to be of value as an early variety. The plants were strong and very true to type; foliage thick, leathery and of a light green color, with bluish-white bloom. The heads are slightly flattened, very solid, crisp and tender; in flavor one of the best. Stem short, stout, upright.

*Solid South*, from T. W. Wood & Sons, strongly resembles Early Summer, and equals it in every way except that it is a few days later. It would be a good substitute for some of the small early varieties.

*Volunteer*, Rawson, produced the largest heads among the early sorts, but did not reach maturity quite as soon. The plants are rank growers and have short, stiff stems. The foliage is bright green, with a bluish tint, thick and leathery, lapping well over the heads. The heads are compact, tender, crisp and have a very mild, desirable flavor.



Among the medium sorts, the only ones not previously described were six varieties received from the Department of Agriculture, Washington, D. C. Nos. 1, 3 and 6 grew more like Brussels Sprouts, forming several heads at the base of the leaves. The stems were long and on some plants there were six or eight heads about two inches in diameter, besides the larger head at the upper end of the stem. The heads were very solid, mild flavored, and had a sparse amount of foliage.

Nos. 2, 4 and 5 had the same tendency, but simply threw out small tufts of leaves from the sides of the stems. The terminal heads on these plants were larger, but about the same in quality. None of the varieties seemed to be true to any special type, and unless further trial should show decided improvements, they are of little value.

The surest headers, best flavored, medium season cabbages are All Seasons, Succession, Market Gardeners' No. 2 and Autumn King, all of which are standard sorts, either for market gardeners or for home use.

### CAULIFLOWER.

Seven varieties of cauliflower were grown, viz.: Algiers, Autumn Giant, Extra Early Paris, Lenormands Short Stemmed Mammoth and Second Early Erfurt from D. M. Ferry & Co., Snowball from Henderson and Walcheren from Vaughan. They were handled the same as the cabbages and planted out with the medium varieties of cabbage. The cabbage disease attacked the plants early in their growth, and but few small heads developed.

### KALE.

Curled Scotch, German Dwarf Purple, Green Curled Scotch, Half Dwarf Curled and Siberian, all from Ferry, is the list of kale grown.

Siberian is an addition to previous lists, and proved to be very much like Green Curled Scotch, except that the leaves are coarser, long and spreading, but very crisp and tender when mature. The kales are not much used, but should be in every garden, because of their attractiveness, the ease with which they can be grown and their pleasant flavor when cooked.

### KOHL RABI.

Three varieties, Early Purple, Early White and Large Green from Ferry, constituted the list of Kohl Rabi. It is grown the same as the cabbage and develops a turnip-shaped swelling of the stem just above ground, which reaches five or six inches in diameter. When properly cooked, they are a valuable addition to the list of garden vegetables.

### CUCUMBERS.

*White Spine* (Arlington). From J. C. Vaughan, Chicago. The White Spine class is the general favorite for table use, and this is the type most largely grown for market purposes.

*Beauty*. From J. Lewis Childs, Floral Park, N. Y. The form of the fruit is too short and thick for pickles or for slicing. It is one of the earliest sorts to mature.

*Emerald*. From A. W. Livingston's Sons. The excellent form, handsome appearance and good quality of the specimens of this variety, together with its long season, make it one of the best for table use.

*Fordhook*, *Jersey* and *Rockford Pickling* are excellent sorts for pickles and for slicing. Rockford was the earliest in season.

*Japanese Climbing.* From J. C. Vaughan. This variety has given excellent satisfaction for several seasons as one of the best sorts for pickling or for table use.

*Long Green.* A common sort largely grown for table purposes.

*Model.* From T. W. Wood & Sons, Richmond, Va. Of White Spine type, though the fruits are more slender and tapering than that class.

*Siberian.* One of the best early sorts for pickling or to furnish small fruits for slicing.

*Table of varieties, Cucumbers.*

Planted May 26.— Variety.	Seedsman.	Pro- duc- tive- ness.	Date of pickling size.	Date of slicing size.	Date of ripening.	Average weight of a single fruit, ounces.
Arlington White Spine.	J. C. Vaughan.	70%	July 18	July 24	Aug. 2	2.5
Beauty.	J. L. Childs.	80 "	" 14	" 20	July 27	7.
Emerald.	A. W. Livingston & Son.	75 "	" 22	" 27	Aug. 7	10.
Fordhook Pickling.	W. A. Burpee & Co.	90 "	" 19	" 24	July 29	9.5
Japanese Climbing.	J. C. Vaughan.	95 "	" 19	" 23	" 23	17.
Long Green.	J. C. Vaughan.	85 "	" 22	" 27	Aug. 5	17.5
Model.	T. W. Wood & Sons.	65 "	" 21	" 26	" 1	7.5
Perfected Jersey Pickle.	Johnson & Stokes.	95 "	" 24	" 30	" 4	7.75
Rockford Pickle.	H. W. Buckbee.	90 "	" 12	" 15	July 19	8.5
Short Green.	D. M. Ferry & Co.	95 "	" 18	" 22	" 27	9.25
Siberian.	J. C. Vaughan.	80 "	" 11	" 14	" 18	6.5

## LETTUCE.

Seed for the varieties grown outdoors was sown in the forcing-house April 8, and the plants were set in the open ground May 18. The table below gives the data obtained from this planting:

*Table of varieties.*

Variety.	Seedsman.	Date of maturity.	Average weight of a single head.
Alaska.	Sunset Seed Co.	June 29	1 lb 8 oz
All Seasons.	J. C. Vaughan.	July 5	1 1/4 oz
Bronzed Curled.	D. Landreth & Sons.	June 30	1 lb 5 oz
Brown and Gold.	J. C. Vaughan.	" 25	13 oz
Crisp as Ice.	A. W. Livingston's Sons.	" 25	12 1/2 oz
Denver Market.	D. M. Ferry & Co.	" 29	1 lb 3 1/2 oz
German Butter.	J. A. Salzer.	July 1	14 oz
Golden Curled.	D. Landreth & Sons.	June 30	1 lb 4 1/2 oz
Grand Rapids.	J. C. Vaughan.	" 30	1 lb 5 oz
Green Fringed.	J. C. Vaughan.	July 1	11 oz
Hamilton Market.	J. A. Bruce & Co.	" 1	1 lb 8 1/2 oz
Heavy Weight.	J. A. Salzer.	June 28	11 oz
Hero.	Jas. Vick's Sons.	July 1	1 lb 6 oz
Iceberg.	J. C. Vaughan.	" 2	1 lb 18 oz
Lancaster.	W. A. Burpee & Co.	June 29	1 lb 1 oz
Mammoth Cabbage.	J. C. Vaughan.	" 29	1 lb 3 1/2 oz
Maximum.	J. M. Thorburn.	July 1	1 lb 4 oz
Morse.	J. C. Vaughan.	June 25	1 lb ..
Myers All Right.	Johnson & Stokes.	" 29	13 1/2 oz
New York.	Peter Henderson & Co.	" 30	1 lb 5 oz
No. 1.	Peter Henderson & Co.	" 23	12 1/2 oz
No. 182.	W. A. Burpee.	" 27	1 lb 5 oz
Noupareil Cabbage.	J. A. Bruce & Co.	July 1	1 lb 8 oz
Prize Head.	J. C. Vaughan.	" 2	12 1/2 oz
Rawson's Hot House.	J. C. Vaughan.	June 19	8 1/2 oz
Salamander.	Johnson & Stokes.	" 30	10 1/2 oz
Wonderful.	H. A. Dreer.	" 30	1 lb 11 oz

The following are recent introductions:

*Alaska.* From Sunset Seed Co., San Francisco, Cal. It forms a loose cabbage head, fourteen to sixteen inches in diameter. The margins of the leaves are waved and curled and the surface is blistered. The color is light green. The leaves are tender but somewhat bitter.

*Bronzed Curled.* From D. Landreth & Sons, Philadelphia. Forms a solid head eight to ten inches high with the leaves spreading twelve to fifteen inches. Somewhat of a Prize Head type but a lighter green and the heads are larger. Tender and the quality is of the best. A most excellent sort.

*Crisp as Ice.* From A. W. Livingston's Sons, Columbus, O. Appears to be identical with *Brown and Gold* and is of the old *Brown Dutch* type.

*Golden Curled.* From D. Landreth & Sons. Appears to be identical with *Alaska*, though the heads average slightly larger in size.

*Hamilton Market.* From John A. Bruce & Co., Hamilton, Ont. It has a large, close head that is very tender and of the best quality. Much like *Iceberg* in habit, except that the outer leaves do not have the purple tinge. A fine outdoor sort.

*Heavy Weight.* From J. A. Salzer, LaCrosse, Wis. A small-growing, close-heading variety that has little value compared with the many better sorts.

*Hero.* From Jas. Vick's Sons, Rochester, N. Y. The type is not fixed. Some plants are a much darker green and more purple than others. A few plants formed loose heads, while others were open and spreading.

*Lancaster.* From W. Atlee Burpee & Co., Philadelphia, Pa. Plants twelve to fourteen inches in diameter and eight inches high; light yellowish-green in color. The inner leaves are very much waved and close together, almost forming a head, but without folding as do the cabbage heading sorts. Tender and delicate in texture and of good quality. Attractive in appearance and a good variety.

*Maximum.* From J. M. Thorburn, New York. A large dark green cabbage-heading sort of fair appearance and quality. The color is too dark to sell well in market.

*Myers All Right.* From Johnson & Stokes, Philadelphia, Pa. A sort closely resembling German Butter, but the heads are closer and scarcely as large.

*No. 2.* From Peter Henderson & Co., New York. The plants form a loose head of a bright yellowish-green color. The inner leaves blanch almost white and are of the best quality. A quick-growing sort but the plants are small.

*No. 132.* From W. Atlee Burpee & Co., Philadelphia. Forms a loose head fourteen to sixteen inches in diameter and eight to ten inches high, of a light yellowish-green color. A large growing sort that remains a long time in condition before sending up a seed stalk. It is attractive in appearance and the quality is good. A fine variety.

*Nonpareil Cabbage.* From J. A. Bruce & Co. The plants closely resemble those of *Hamilton Market*.

*Salomander.* From Johnson & Stokes. A small heading sort, light yellowish-green in color. Tender and quality very good, but the heads are too small.

*Wonderful.* From H. A. Dreer. Plants sixteen to eighteen inches in diameter and ten to twelve inches high. Of *Iceberg* type, but scarcely as

close and firm heading, and a darker green color. The leaves are tender and the quality good. An excellent dark-colored variety.

#### SUMMARY OF VARIETIES.

For the forcing-house and hot-beds we have found no better variety than Grand Rapids of the loose-growing sorts. If a heading lettuce is desired for forcing purposes, Tennis Ball, Boston or Rawson's Hot House would give good results.

Of the varieties grown in the open ground, none has given better satisfaction than has Iceberg. It is a large-growing, close-heading variety, attractive in appearance and excellent in quality. It stands the heat well and remains a long time in condition. Hamilton Market, Morse, Prize Head and Wonderful are also good out-door sorts.

#### ONIONS.

The onions were grown in a sand loam that was not an ideal onion soil, but fairly good results were secured. Aside from the variety test, some work was with the Prizetaker by starting the seed under glass and transplanting to the field. The results were very satisfactory and showed that the large, late varieties of onions can be grown in that way, and that the work of transplanting was little if any more than the first hand-weeding, while a considerable saving of seed can be made.

Burpee's *Australian Brown*, so named from the home of its origin, is one of the best general purpose onions in our list. They are of a slightly flattened, globular form, averaging three inches in diameter, and one and three-fourths in thickness. They are of a brownish red color, and are very firm and solid. While they mature early in the season, they appear to be good keepers. The flavor is mild and pleasant.

*Bermuda Red*, from D. M. Ferry & Co., averaged the same in size, and about the same in firmness. The color was a pale red; texture rather coarse, and flavor mild. This variety matured early and very evenly.

*Delicatesse*, from J. A. Everitt & Co., is a flat onion, mild in flavor, but rather soft and coarse. The color was a delicate pink, with a white center. They grew large, measuring four inches in diameter.

*Extra Early Red*, and *Giant Rocca* were both received from D. M. Ferry & Co. Early Red is a flat, slightly coarse, medium sized variety, rather strong in flavor. It is solid and of some value as an early market sort.

*Giant Rocca* reached a diameter of three inches and was nearly spherical in form. Our season is rather short for it to reach its full size. The color is light red; texture coarse; flavor medium.

*Gladiator*, J. A. Salzer Seed Co., is a globe-shaped onion, about three and one-half inches in diameter. The skin is thin, light red; texture coarse; flavor mild. The tops dried down early, and the bulbs, which were quite solid, matured in good season.

*Mammoth Silver Skin*, Marzajola, Michigan Yellow Globe, Prizetaker, Queen, Red Wethersfield, Southport Red Globe, Southport Yellow Globe, Southport White Globe, Italian, Perpetual, Round Silverskin, White Silverskin, Yellow Danvers and Yellow Dutch were received from D. M. Ferry & Co.

*Michigan Yellow Globe* was among the best, being nearly spherical in form and of high quality. It is valuable for commercial growing, as it is productive, attractive in appearance and a good keeper.

Peas may be divided into four classes, according to the height of the vines and various characteristics of seeds and pods. The varieties first described may be regarded as types of the several classes.

**Class I.** Plants tall, averaging about four feet in height; seeds white, greenish or cream colored; pods slightly curved. There is no better variety in this class than *Champion of England*. Its quality and productiveness make it a desirable sort both for commercial purposes and the family garden.

*Long Island Mammoth*, one of Dreer's standard sorts, is a strong grower with very large, coarse leaves. The pods were extra large, but did not fill, which caused it to rank low in productiveness. The peas are wrinkled, greenish in color and of excellent quality, which places it among the desirable sorts.

*Mammoth Luscious*, from Maule, has vines four feet in height, which branch near the ground and make an abundant growth; leaves small, light green; pods large, very irregular in form and development. The peas are greenish white, of good size, tender and of good flavor, but the pods were not filled.

*Saint Duthus*, received from Wm Henry Maule, is one of the best late varieties. The vines are rank, strong growers, with dark green leaves, and are very prolific; pods long, pointed at the apex, well filled with tender, sweet peas. The length of its edible maturity is also a desirable feature.

**Class II.** Half Dwarf, two or three feet high; seeds smooth or wrinkled, green or cream colored; pods nearly straight.

*C. P. R. Bruce*, is very rank and coarse in growth, and showed traces of mildew this year. The pods are long and pointed at both ends, but were not well filled. Peas are of the marrow type, plump, tender and of the best quality. If it were more productive, it would be a valuable sort.

*Dexter*, from Rawson, is a straight podded, rank growing variety. The pods are well filled with plump, sweet peas, and, as it is also quite productive, it is a desirable variety.

*Duke of York*, from Dreer, is claimed to be a selection from the *Duke of Albany*. The vines are coarse, upright growers, densely covered with light colored foliage. Pods numerous, pointed, straight, and fairly well filled with tender, rich peas. As they mature at one time, it is a desirable variety for the market garden.

*Earliest and Best*, Salzer, is an upright grower, with vines branching near the ground; foliage thick, light colored; pods numerous, straight and well filled with large, tender, sweet peas.

*Electric*, from Dreer, resembles *Earliest and Best* in growth, but lacks in productiveness. The quality is good.

*Family Garden*, sent out by Wm. Henry Maule, is a good growing variety, very prolific and produced peas of the highest quality. No mistake will be made in sowing this variety.

*Gradus*, W. A. Burpee. Vines are of a strong habit, branching, with light green foliage; pods nearly straight, pointed, almost round. The peas are large, tender, sweet, and remain in edible condition a long time. This promises to be a valuable acquisition.

*John Bull*, from Thorburn, is an old standard variety of good quality and average productiveness.

*Juno*, one of Peter Henderson & Co.'s varieties, is desirable for the main crop. The vines are of dark colored rank growth, and averaging about two

feet in height. They branch low and do not require support; pods nearly round, slightly curved and well filled with tender peas of excellent flavor.

*Michaelmas*, Sunset Seed Co., belongs to this class. The vines mildewed badly, which checked their growth; otherwise they seemed to be good growers, and have large pods, filled with peas of good quality.

*Sanders Marrow*, Thorburn. The vines are light green in color and quite productive. Pods long, pointed; peas large, tender. This variety showed blossoms and edible peas at the same time, and had a long edible period.

Class III. Half Dwarf, two or three feet high; peas blue, wrinkled or smooth; pods straight.

*Acme*, T. W. Wood & Sons, lacks a little in productiveness. The vines are vigorous and produced a fair amount of pods that were well filled with plump peas of good flavor.

*Anticipation*, Sunset Seed Co., is a low branching, coarse growing variety, which matures very evenly. It is quite productive and in quality is up to the standard of its class.

*Bishops Dwarf*, Landreth, is an old variety of good quality, but its short length of edible maturity prevents its becoming one of the standard sorts.

*Extra Early Market*, J. M. Thorburn & Co., has light green foliage. It is quite prolific, and matures evenly, which together with its good quality, makes it a desirable sort.

*Lightning Express*, Buckbee, is a good growing variety, and produced an abundant crop of pods well filled with peas of high quality.

*Omega*, *Perfect*, *Perpetual*, *Philadelphia*, *Record*, *Reliance*, *Ringleader*, *Startler*, *Summit* and *Sweet Market* resemble each other in habit, and their quality is up to the average of their class.

Class IV. Vines dwarf, one-half to two feet high; pods straight or slightly curved; peas cream or bluish.

The well-known *American Wonder* is a type of this class, and is valuable either for home use or market.

*Ameer*, *English Wonder*, *King*, *May* and *Prize* are worthy of special notice, and will be valuable additions to the standard varieties.

## POTATOES.

The land used for the experimental plot during the past season is located on the north side of the vegetable garden. The soil is a sand loam, very rich in vegetable humus. The ground had been used several years in growing strawberries, and after the fruiting season of 1897 had passed it was plowed, well worked down and about the middle of August seeded to crimson clover, which made a very dense, rank growth, reaching a height of eight to ten inches before the ground froze.

As soon as the ground was in proper condition the following spring, it was plowed, rolled and harrowed at frequent intervals, until the time of planting. The early varieties were planted May 14 and the late ones June 4. The seed was treated with corrosive sublimate (1-2,000) for one hour, and the crop showed a very small amount of scab. At the time of planting, furrows six inches deep and forty-two inches apart were made and each variety was given a space in the row forty feet long. Two pounds of each variety was used for seed and was cut into twenty-five pieces, which were dropped eighteen inches apart. The seed was covered with a hoe, after which the ground was rolled with a heavy roller to pack the soil. To prevent the evaporation of moisture

from the soil and hinder the growth of small weeds, a weeder was used at intervals of four to six days until the plants were about five inches high, after which a Planet, Jr., cultivator was used, strictly adhering to level culture. Both early and late varieties were watered by the irrigating system about the time of setting and once when the tubers were half grown. The season was very favorable for the growth of the plants, and as they were not killed by frost until the middle of October, many varieties continued to grow, even though the tubers reached edible maturity earlier in the season.

*Table of varieties, plot planted May 14.*

Early varieties.	Seedsman.	Height and color of vines.	Date of maturity.		Yield per acre, bushels.			Average yield for 1897 and 1898.	General average.	Number of years averaged.
		Inches. L. G. (light green.) D. G. (dark green.)	Edible.	Market.	Large.	Small.	Total.			
Acme.....	Dep't.....	18..L. G.	Aug. 1	Aug. 1 <sup>1</sup>	72.56	10.38	82.92	106.25	125.25	3
Algoma.....	".....	16..L. G.	" 6	" 18	49.34	33.66	83.00	90.61	90.61	2
Andes.....	".....	18..L. G.	July 28	" 10	121.81	2.59	124.4	99.77	99.77	2
Belle.....	".....	18..D. G.	Aug. 6	" 16	75.15	18.14	93.29	137.35	148.59	3
Blush.....	".....	16..D. G.	" 1	" 14	204.74	7.77	212.51	152.9	152.9	2
Bovee.....	".....	18..L. G.	" 3	" 18	88.11	23.32	111.43	138.65	107.18	4
Dawn.....	H. C. Marsh.	15..L. G.	" 1	" 15	72.56	10.38	82.92	-----	-----	1
Delaware.....	Gregory.....	18..L. G.	" 26	Sep. 15	308.40	10.38	318.78	-----	-----	1
Garfield.....	Landreth.....	20..L. G.	" 28	" 15	308.40	12.95	321.35	-----	-----	1
Herrington Pear.....	Dep't.....	20..L. G.	" 16	Aug. 28	377.30	12.95	390.25	295.44	295.44	2
Honeye Rose.....	".....	24..D. G.	" 10	" 18	150.31	15.55	165.86	146.42	126.98	3
Hurst.....	H. C. Marsh.	12..L. G.	" 8	" 20	191.78	5.18	196.96	-----	-----	1
Irish Cobbler.....	Dep't.....	18..L. G.	" 6	" 14	145.18	20.78	165.96	202.14	204.4	3
Kansas.....	".....	18..D. G.	" 1	" 16	152.91	10.38	163.27	161.77	-----	2
King of the Earlies.....	".....	15..L. G.	" 6	" 17	44.05	15.55	59.6	68.67	107.51	4
Michigan.....	".....	18..L. G.	July 28	" 10	165.86	10.38	176.22	158.09	148.35	3
Montana Rose.....	Northrup.....	20..D. G.	Aug. 1	" 20	150.31	10.38	160.67	-----	-----	1
Norther.....	Dep't.....	22..L. G.	" 6	" 15	191.78	12.95	204.73	184.00	186.98	2
Ohio.....	E. Tully.....	20..D. G.	" 1	" 10	150.31	5.18	155.49	-----	-----	1
Peachblow.....	Dep't.....	22..D. G.	" 1	" 20	119.31	5.18	124.49	142.58	193.27	4
Pinkeye.....	".....	18..L. G.	July 28	" 14	77.75	15.55	93.3	125.1	184.76	3
Pride.....	".....	18..D. G.	Aug. 6	" 18	75.15	10.38	85.53	108.06	127.84	3
Quick Crop.....	".....	18..L. G.	" 1	" 10	114.08	18.14	132.17	112.73	123.37	3
Head 86.....	".....	22..D. G.	" 6	" 22	98.3	12.95	108.25	97.18	123.57	4
Richmond Belle.....	Wood & Sons	24..D. G.	" 1	" 16	243.61	-----	243.61	-----	-----	1
Roberts.....	Gregory.....	18..L. G.	" 6	" 12	176.22	10.38	186.59	-----	-----	1
Six Weeks.....	Dep't.....	24..D. G.	" 2	" 12	176.22	7.77	184	88.24	-----	2
Snowball.....	".....	20..D. G.	July 28	" 10	124.4	2.59	126.99	126.98	-----	3
Snowflake Jr.....	".....	20 Purple	Aug. 1	" 18	287.67	2.59	290.26	248.13	222.55	5
State of Maine.....	Landreth.....	22..L. G.	" 1	" 14	116.62	10.38	126.98	-----	-----	1
Thoroughbred.....	Dep't.....	18..L. G.	" 1	" 13	165.86	18.14	184	141.24	138.22	3
Trumbull.....	".....	20..L. G.	" 6	" 19	139.95	12.95	152.9	119.21	-----	2
White Lily.....	".....	18..L. G.	" 6	" 20	88.11	25.91	114.02	112.73	132.23	4
" Ohio.....	".....	15..L. G.	" 6	" 16	132.17	5.18	137.35	109.84	-----	2
Woodhull.....	".....	24..L. G.	" 16	" 24	178.82	25.91	204.73	222.55	-----	2
Wood's Earliest.....	Wood & Sons	18..D. G.	July 28	" 8	72.56	5.18	77.74	-----	-----	1

Table of varieties, plot planted June 4.

Late varieties.	Seedsman.	Height and color of vines.	Date of maturity.		Yield per acre, bushels.			Average yield for 1897 and 1898.	General average.	No. of years averaged.
			Edible.	Market.	Large.	Small.	Total.			
Abundance.....	Dep't.....	24..L. G.	Sep. 10	Sep. 28	191.78	20.73	212.51	186.59	219.42	3
Accidental.....	".....	27..D. G.	" 6	" 18	160.68	.....	160.68	181.7	.....	2
Adirondac.....	".....	21..L. G.	" 15	" 30	207.33	5.18	212.51	199.55	188.31	3
American Beauty.....	".....	18..L. G.	" 8	" 20	88.11	5.18	93.29	85.37	155.48	3
Arizona.....	".....	24..L. G.	" 1	" 10	155.5	7.77	163.27	136.05	.....	2
Battles' Best.....	".....	28..D. G.	" 20	" 30	381.73	5.18	386.91	243.61	.....	2
Beauty of Beauties.....	".....	26..D. G.	" 16	" 25	290.26	2.59	292.85	126.99	.....	2
Blush.....	".....	24..L. G.	" 4	" 20	119.21	5.18	124.39	121.8	.....	2
Burr No. 1.....	".....	18..L. G.	" 1	" 12	114.03	5.18	119.21	121.8	.....	2
Carman No. 1.....	".....	26..D. G.	" 15	" 28	347.27	2.59	349.86	269.52	220.69	5
Carman No. 3.....	".....	26..D. G.	" 15	" 28	316.18	28.5	344.68	256.56	282.22	4
Champion of the World.....	".....	28..L. G.	" 20	" 29	155.5	7.77	163.27	121.75	231.51	3
Clarendon Beauty.....	".....	24..L. G.	" 24	Oct. 6	233.25	7.77	241.02	159.38	.....	2
Clinton.....	A. F. Currier	28..D. G.	" 8	Sep. 30	248.8	10.36	259.16	.....	.....	1
Columbus.....	Dep't.....	30..L. G.	" 18	" 26	253.98	20.73	274.71	216.4	.....	2
Dutton.....	Chapman	26..D. G.	" 16	" 26	196.96	5.18	202.14	.....	.....	1
Endurance.....	Dep't.....	24..D. G.	" 20	Oct. 8	145.13	5.18	150.31	105.13	.....	2
Enormous.....	".....	24..L. G.	" 20	Sep. 30	160.68	2.59	163.27	165.86	290.25	3
Flagle.....	".....	24..D. G.	" 20	" 28	248.8	5.18	253.98	168.45	202.14	3
Fottler Peachblow.....	".....	26..D. G.	" 26	Oct. 8	176.33	5.18	181.41	147.72	218.45	3
General Purpose.....	".....	24..L. G.	" 12	Sep. 20	57.01	7.77	64.78	93.29	169.31	3
Good Times.....	".....	26..D. G.	" 14	" 26	285.08	5.18	290.26	233.24	.....	2
Harvest Queen.....	".....	26..L. G.	" 20	" 30	217.7	7.77	225.47	171.04	228.06	3
Hewes.....	Vaughan	21..L. G.	Aug. 24	" 6	111.44	2.59	114.03	.....	.....	1
Honeoye Rose.....	Dep't.....	20..L. G.	" 22	" 2	116.62	36.28	152.9	133.46	118.34	3
Hoosier.....	B. W. Steers.	10..L. G.	Sep. 4	" 16	.....	5.18	5.18	.....	.....	1
Irish Mignon.....	Dep't.....	24..D. G.	" 10	" 24	121.81	10.36	132.17	110.14	.....	2
Joseph.....	".....	26..L. G.	" 20	Oct. 4	243.61	23.32	266.93	187.7	.....	2
King of the Roses.....	".....	24..L. G.	" 1	Sep. 10	129.58	46.65	176.23	132.17	141.73	3
Klondyke.....	".....	26..L. G.	" 10	" 18	186.6	36.28	222.88	217.69	.....	2
Leonard.....	".....	28..D. G.	" 18	" 30	313.58	31.1	344.68	224.17	.....	2
Lightning Express.....	".....	26..D. G.	" 4	" 18	222.88	25.91	248.89	181.45	183.57	5
Lincoln.....	".....	30..D. G.	" 20	" 28	222.88	31.1	253.98	207.32	.....	2
Livingston.....	Livingston	26..D. G.	" 20	" 29	347.27	31.1	378.38	.....	.....	1
Livingston Banner.....	Dep't.....	24..D. G.	" 16	" 24	310.99	10.36	321.35	233.23	298.03	3
Long Keeper.....	".....	24..L. G.	" 24	" 30	129.58	7.77	137.35	149.01	.....	2
Maggie Murphy.....	".....	24..L. G.	" 12	" 20	145.13	28.5	173.63	169.74	233.37	3
Maule XXX.....	Maule	26..D. G.	" 16	" 26	129.58	5.18	134.76	.....	.....	1
Michigan Beauty.....	Dep't.....	24..L. G.	" 18	" 29	181.41	41.46	222.87	133.46	128.72	3
Mills Banner.....	".....	27..D. G.	" 19	" 29	145.13	28.5	173.63	203.43	.....	2
Mills Prize.....	".....	30..L. G.	" 24	" 30	219.29	67.38	286.67	220.28	.....	2
Milwaukee.....	".....	24..L. G.	" 6	" 20	142.54	46.65	189.19	164.56	152.92	5
Minnehaha.....	E. Tully	18..L. G.	" 2	" 16	121.81	18.14	139.95	.....	.....	1
Montana Wonder.....	Northrup	26..D. G.	" 20	" 30	134.76	31.1	165.86	.....	.....	1
Napoleon.....	King & Co.	24..D. G.	" 14	" 24	145.13	23.32	168.45	132.67	231.51	3
Onward.....	Dep't.....	26..D. G.	" 20	" 28	132.17	67.38	199.55	147.71	.....	2
Orphans.....	Chapman	25..L. G.	" 20	" 29	331.73	25.91	357.64	.....	.....	1
Padelfords.....	Dep't.....	26..L. G.	" 4	" 20	215.1	38.87	253.97	200.42	.....	2
Peachblow.....	".....	24..D. G.	" 28	Oct. 10	233.25	23.32	256.57	193.02	273.84	3
Perfection.....	".....	24..D. G.	" 6	Sep. 18	145.13	41.46	186.59	168.45	.....	2
Pingree.....	Northrup	26..L. G.	" 20	Oct. 1	215.1	41.46	256.57	.....	.....	1
Planet, Jr.....	King & Co.	25..L. G.	" 20	Sep. 28	129.58	33.69	163.27	164.56	.....	2
Pride of Michigan.....	Dep't.....	26..L. G.	" 20	" 12	98.48	7.77	106.25	.....	.....	1
	L. L. Olds	24..L. G.	" 2							



Table of varieties, plot planted June 4.—CONCLUDED.

Late varieties.	Seedsman.	Height and color of vines.	Date of maturity.		Yield per acre, bushels.			Average yield for 1897 and 1898.	General average.	No. of years averaged.
		Inches. L. G. (light green.) D. G. (dark green.)	Edible.	Market.	Large.	Small.	Total.			
Pride of Seneca.....	Dep't.....	24. L. G.	Sep 14	Sep. 26	145.18	25.91	171.04	153.29	.....	2
Read 99.....	".....	24. D. G.	" 10	" 70	116.82	36.28	153.9	143.85	.....	2
Rose of Erin.....	".....	24. D. G.	" 16	" 23	155.5	34.23	191.78	156.79	.....	2
Rose Standish.....	".....	".....	" 16	" 28	139.95	25.91	165.86	141.22	157.23	2
Rural New Yorker.....	".....	24. L. G.	" 20	" 29	176.23	20.73	196.96	173.82	192.32	9
Rutland Rose.....	".....	26. D. G.	" 18	" 23	56.6	26.91	85.51	92.77	209.06	2
Seedling No. 2.....	".....	26. L. G.	" 20	" 28	111.44	7.77	119.21	95.88	.....	2
Sir Walter Raleigh.....	".....	".....	" 24	Oct. 4	166.86	25.91	191.77	173.38	.....	2
Suffolk Beauty.....	".....	24. D. G.	" 6	" 6	155.5	10.86	165.86	154.19	.....	2
Taylor.....	Taylor.....	26. L. G.	" 10	Sep. 30	196.96	20.73	217.77	.....	.....	1
Uncle Sam.....	Dep't.....	24. D. G.	" 22	Oct. 80	106.25	16.55	121.8	145.01	143.53	2
Unknown.....	".....	".....	" 26	Oct. 10	212.51	12.95	225.46	156.78	139.06	2
Vanguard.....	".....	26. L. G.	" 18	Sep. 30	202.15	.....	202.15	145.13	217.57	5
Venezuela.....	Pingree.....	24. D. G.	" 20	" 28	75.15	15.55	90.7	.....	.....	1
Vigoresa.....	Dep't.....	24. L. G.	" 16	" 24	176.39	81.1	257.38	186.59	163.19	2
White Peachblow.....	".....	26. D. G.	" 23	Oct. 10	225.47	28.5	253.97	117.72	.....	2
Wonderful.....	Hammond.....	24. L. G.	" 24	Sep. 30	155.5	5.18	160.68	.....	.....	1

The Colorado potato beetles were very numerous in the early part of the season, which made it necessary to spray the vines often; but the late varieties were sprayed only when they were about four inches high and when half grown. For this purpose white arsenic instead of Paris green was used with good results. Great care, however, must be taken in the use of arsenic, or the foliage will be injured. It should be prepared as follows: For one pound of arsenic, take two pounds of unslaked lime, and two gallons of water. Slake the lime in the water and heat until it comes to the boiling point; then add the arsenic and let it boil slowly for thirty minutes. The arsenic will dissolve and unite with the lime, forming an insoluble compound, which can be used without danger of injuring the foliage, at the rate of 200 gallons of water for one pound of arsenic. Bordeaux mixture was also applied to the entire crop as a preventive against leaf blight.

In addition to using the more promising of the varieties tested in 1897, an endeavor was made to secure new varieties from seedsmen and introducers. The addresses of the seedsmen from whom the new varieties were received are as follows: T. W. Wood & Sons, Richmond, Va.; J. C. Vaughan, Chicago, Ill.; D. Landreth & Sons, Philadelphia, Pa.; A. W. Livingston's Sons, Columbus, O.; James J. H. Gregory & Son, Marblehead, Mass.; Wm. Henry Maule, Philadelphia, Pa.; H. C. Marsh, Muncie, Ind.; Northrup, King & Co., Minneapolis, Minn.; L. L. Olds, Clinton, Wis.; H. N. Hammond, Decatur, Mich.; P. E. Chapman, Peruville, N. Y.; E. Tully, Penza, O.; A. F. Currier, Duplain, Mich.; B. W. Steere, Carthage, Ind.; F. D. Taylor, Traverse City Mich.

## NOTES ON NEW VARIETIES.

*Clinton*.—A medium late kind which appears to be productive and in every way promising. The vines are dark green, strong growers, branching close to the ground and exceeding two feet in height. The tubers are medium to large in size; in shape, round, or a little elongated and slightly flattened; skin, clear white, smooth, finely netted and spotted with numerous small dots; eyes, long, broad and shallow, slightly lipped. The texture is firm, white and floury.

*Dawn*.—An early variety that resembles Early Ohio in growth, but is a little different in form. The vines are also more slender than those of the Ohio. The tubers averaged rather small; shape, long, roundish and tapering, being larger at the stem end; skin, light pink, with small russet and pink patches scattered over the surface. The eyes are of medium depth with strong markings, pinkish, open and shallow, well scattered over the surface; flesh, very firm, solid and white. The yield was light, but owing to its other promising characteristics, it will be given further trial.

*Delaware*.—A medium early variety that possesses many strong points. The tubers reached edible maturity rather early, but the season was favorable for their growth, and the vines remained green until the late varieties were harvested; the plants are strong, light green, upright growers, and form a compact covering for the hills. The tubers are roundish or of a somewhat irregular, oblong, flattened form. They were slightly inclined to be knobby, but this, perhaps, was due to the season; skin, white, finely netted; eyes numerous, strong, well distributed, rather open and deep. The flesh is solid, white and fine grained.

*Dutton*.—Considered a leading market variety in some parts of New York state. Size, medium to large; long, oval, tapering towards the stem. The skin is white and smooth; eyes, narrow, small, shallow with pink markings, and slightly lipped; flesh, firm, white and a little coarse. The vines are strong and thrifty, with a light green tint.

*Garfield*.—A variety with medium sized, light green vines, that reached edible maturity as soon as many of the early sorts, but continued to grow until late in the season. The potatoes were very regular, oblong and little flattened; eyes, about medium in number, well scattered, small, white, slightly lipped and not very deep; skin, white, finely netted and with a slight russet appearance. The flesh is firm, fine grained and very white. This and Delaware are two very promising varieties that closely resemble each other.

*Hewes*.—A seedling received from Vaughan, the tubers of which though rather small, were very regular, and of a desirable elongated, oval, flattened shape. The skin is cream white, finely netted and specked with numerous raised dots, or minute pimples; eyes, open, shallow, pink, with strong seed sprouts. The texture and flavor are very desirable, and the markings strongly resembling those of the Early Ohio. Will be given further trial.

*Hoosier*.—A pinkish-white, smooth-skinned potato, with some desirable characteristics, but the yield was so small that it will be tried again before any description is given.

*Hurst*.—Vines are of short but strong, upright growth, and of a light green color. The tubers averaged about medium in size, but are not of a desirable shape, being long, pointed at the ends and crooked, which makes them appear necky. The skin is white, finely netted; eyes, shallow, scattering and

sometimes raised above the surface. The quality is up to the standard, but the appearance of the potato is against it for a market variety.

*Livingston.*—A new late variety, originated at Columbus, O., which resembles Seneca Beauty, except in color. The vines are strong, upright growers with a thick mass of large dark-green leaves; the tubers average large, rather coarse; shape, oblong, slightly flattened; skin, clear white, netted. The eyes are small, shallow and scattering, and have decided pink markings; flesh, white, firm, but a little coarse. Owing to its excellent growth, size, shape and quality, this variety promises to be among the leaders.

*Maule XXX.*—An attractive pinkish-white potato, uniformly of large size; shape, long, flattened. The skin has a delicate pink tint, is netted and somewhat veined; eyes, rose-colored, narrow, deep, strongly lipped and with prominent buds. The eyes are evenly distributed over the surface, and one of the leading characteristics seems to be a slight fan-shaped wing, extending from the tip and sometimes from the base of the eye; flesh, white, rather coarse. This variety is a strong grower, and the tubers appear somewhat coarse, while the ridges around the eyes give them a rough appearance.

*Minnehaha.*—A medium season variety, having short, stocky, upright vines. The tubers averaged medium to large in size; shape, long, slightly curved, with oval ends and of uniform size the entire length; skin, clear white, or slightly netted; eyes, small, rather deep, numerous; flesh firm, solid and white. Its cooking qualities are good, but the shape and lack of productiveness prevent its being of special promise.

*Montana Rose.*—A light rose-colored variety, very uniform in size; shape, flat, oval or somewhat elongated; skin, thickly netted and prominently veined; eyes, small, shallow, located mostly toward the seed end. In texture they appear a little spongy, but the flesh is white and starchy. The vines are dark green, strong growers, of medium height and of branching habit. Although only a small yield was obtained, the other good qualities of the variety will secure for it further trial.

*Montana Wonder.*—A medium late variety that lacked in productiveness, but has other redeeming qualities. The tubers are large, long, oval, rather irregular; eyes, numerous, well scattered, shallow, many being even with the surface, and with prominent elevated lips, while others are sunken in an irregular pocket, making the tubers appear rough. The skin is white, finely netted, and the quality excellent. The vines are dark green and rank growers.

*Ohio.*—Mr. E. Tully, of Penza, Ohio, sent a sample of seed for trial, which proved to be a very fine strain, showing that the variety has been kept pure by careful selection, which has probably prevented the usual deterioration, noticeable in this variety. The tubers were large, oval, symmetrical, smooth and of the usual high quality.

*Orphans.*—Received from Peruville, N. Y., proved to be very choice stock of that variety. The plants were strong and the yield speaks for itself, being considerably larger than was secured from seed grown here for three years. This shows the advisability of occasionally changing the seed. No difference in the quality was noticeable. The tubers are large, regular, oblong, flattened; eyes, few, shallow, well scattered; skin, netted, white; flesh, firm, white and dry.

*Pingree.*—A very clear white-skinned potato, free from dots or bunches; shape, slightly oval, with a large seed end tapering to the stem. The eyes

are broad, open, shallow, white and scattering; in texture they are very firm and floury. The vines are strong, light green, upright, branching growers.

*Pride of Michigan*.—The tubers are of good size but rather rough in appearance and with an irregular, oblong shape. The skin is of a delicate pink and white tint, finely netted, and with a smooth, velvety appearance. The eyes are large with pink markings, open, usually on the surface, though some are deeply sunken; quality good; vines of medium size, branching close to the ground. Although lacking in productiveness, and rougher than is desirable, the quality is such that they will be given further trial.

*Richmond Belle*.—One of the most productive of the early varieties. Size, medium to large; shape, round to oblong, some being considerably elongated. Tubers all merchantable. The eyes are broad, shallow, pink, few in number and well scattered; very solid, firm and of high quality. This is a promising sort, and while it resembles the old variety, Early Belle, it seems to be a stronger grower.

*Roberts*.—Said to be a sport from Queen, but differs in color, having a clear white netted skin. The tubers averaged rather small, oval, slightly flattened; eyes, shallow, small, with pink markings; quality good, being firm, dry and of good flavor. It is considerably advertised as a choice, early sort, but our trial for one year does not enable us to pronounce it superior to many others.

*State of Maine*.—In form, round and regular, with a white netted skin. The eyes are small, round and shallow, with fan-shaped extensions from the edges of the lip; flesh, firm and dry, but a little strong. A strong growing, early sort, but it lacks in productiveness.

*Taylor*.—A sport of Hebron, which gave a good yield of desirable tubers. They are large, oblong, a little flattened and with a tendency to taper toward the ends; skin, clear, white, slightly netted; eyes, narrow, small, deep, prominently lipped, and well distributed, although a majority are toward the seed end; flesh, white, dry and floury. Taylor is a little later than Hebron and has coarser vines, which average over two feet high, and branch close to the ground.

*Venezuela*.—A potato brought from the country to that name, by Governor H. S. Pingree, the seed of which was received here October 15, 1897. The tubers were in a poor state of preservation and at the time of planting, many were badly decayed, which had a tendency to weaken the eyes. The plants, however, made a fair growth and developed a strong, medium sized vine. The tubers were of average size, long, pointed, rather irregular, somewhat flattened; skin, smooth, dark purple, with occasional white spots; eyes, broad, very deep, and dark purple. They resemble Early Rose in form, but the color is such that they would not become a market variety, even if they were up to the average in productiveness.

*Wood's Earliest*.—One of the first to mature, but lacking in productiveness. The tubers were medium to large; shape, irregular, round to oblong; skin, pure white, with occasional small patches of purple; eyes, strong, deep, purple, lipped very much like Peachblow, scattered evenly over the surface. The flesh is pure white and firm, but it seems to be a little watery.

*Wonderful*.—A long, rather coarse, oval potato, having a white, finely netted skin. The eyes are broad, open and of medium depth, giving them a smooth appearance; flesh firm, white and watery; vines are strong growers, but the yield was unsatisfactory.

## SUMMARY.

The yields this season show a decided increase over those of 1898.

Thirty-one varieties last year planted May 11, averaged 130.1 bushels per acre; this year thirty-six varieties planted May 14, showed a yield of 159.5 bushels, an increase of 29.4 bushels per acre.

The seventy-one sorts planted June 4, averaged 201.24 bushels per acre, while seventy-five planted June 4, 1897, only averaged 124.88 bushels per acre, or a difference of 73.36 bushels in favor of the crop of 1898.

The soil for the two tests was very similar, but the summer of 1898 was a month longer and more favorable for large yields, although in some instances it was detrimental to the quality of the tubers.

Among the more promising of the new extra early varieties, maturing in July, is Andes, which gave a yield of 124.4 bushels, and was fully ripe July 26, although the tubers were merchantable a week or ten days earlier. Early Michigan, a choice, smooth, white potato, ripened only two days later and gave a yield of 176.22 bushels. Snowball, a round, white variety, gave 126.99 bushels per acre.

Of those maturing about August 1, or less than a week after Andes, is Snowflake, Jr., which yielded at the rate of 290.26 bushels per acre. It is an oblong, smooth potato, of high quality, that has been grown here for five years, and for that period has averaged more than 200 bushels per acre. Richmond Belle comes next (243.61 bushels), followed by Blush (212.51 bushels) and Kansas (163.27 bushels), both of which are of standard quality. Norther (204.73 bushels), a variety of the Rose type, has been grown for six years, and is one of the best second early sorts, ripening about a week after Early Michigan.

## MEDIUM VARIETIES.

Of the medium varieties, Garfield (321.35 bushels) and Delaware (318.76 bushels) gave the largest yields. Herrington Peer (290.25 bushels) matured a few days earlier, but did not quite reach its yield of last year. It is a seedling of Early Rose and the two are nearly identical, but the quality of Peer is superior. Last season it yielded at the rate of 300.62 bushels per acre.

The season was very favorable for the maturing of the late varieties, some of the later kinds being still green and uncut by frost when they were harvested, about the middle of October.

Livingston (378.38 bushels) gave the largest yield, but Leonard (344.66 bushels), Battles' Best (336.91 bushels), Livingston Banner (321.35 bushels) and Orphans (357.64 bushels) are heavy croppers, of good quality and promise to become standard varieties.

Carman No. 1 (349.86 bushels) and Carman No. 3 (344.68 bushels) raised their average, and still stand as leaders among the commercial varieties. The latter is, as a rule, rather more productive than Carman No. 1, and in many sections is being extensively planted in place of Rural New Yorker.

## THE PREVENTION OF POTATO SCAB.

During the last two seasons, tests have been made of various materials as preventives of the scab upon potatoes. The ground selected had not been used for growing potatoes for several years, and hence the soil should have been free from the scab germs. The variety used for the experiment was

Carman No. 3, and in selecting the tubers, special pains were taken to have more or less scab upon each of the tubers. The remedies and methods of applying them were as follows: (1) Chloride of lime sprinkled upon the seed dry, after it was dropped. (2) Chloride of lime as a 5% solution in which the seed was soaked for three hours. (3) Formaldehyde gas to which three lots of seed were exposed for two, five and seven hours, respectively. (4) One-half per cent formalin, in which five lots of seed were soaked two, four, six, ten and twenty-four hours, respectively. (5) Lysol, one-half per cent, in which different lots were treated two, four, six and ten hours. (6) Carbolic acid, two per cent solution, in which four lots were soaked for two, four, six and ten hours. (7) Ohlorine gas, to which the seed was exposed for three hours in a tight receptacle. (8) Corrosive sublimate, at the rate of one part to two thousand of water, in which the seed was soaked for one-half hour.

Rows forty feet long were planted with seed that had been treated in each of the above ways, and four additional rows were planted with seed that had not been treated, as a check. A record was kept of the number that grew with each of the treatments, and when the crop was harvested, the per cent of tubers that were scabbed was determined. The results are given in the following table, with the cost of each treatment for one acre of potatoes. It

*Scab Experiment.*

Material Used.	Manner of Application.	Per cent of Plants that Grew.	Per cent of Potatoes Scabbed.	Cost of Material per acre, cents.
Chloride of lime in the hills.....	Sprinkled on the seed dry.....	10	0	50
Chloride of lime 5% solution.....	Soaked seed 3 hours.....	75	10	32
Formaldehyde gas.....	In closed receptacle 2 hrs.....	25	1	6
" " ".....	" " 5 ".....	0	0	6
" " ".....	" " 7 ".....	0	0	6
Formalin solution 1/2%.....	Soaked seed 2 hours.....	98	2	10
" " ".....	" " 4 ".....	35	1	10
" " ".....	" " 6 ".....	30	1	10
" " ".....	" " 10 ".....	8	0	10
" " ".....	" " 24 ".....	4	0	10
Lysol solution 1/2%.....	Soaked seed 2 hours.....	60	2	20
" " ".....	" " 4 ".....	48	1	20
" " ".....	" " 6 ".....	35	0	20
" " ".....	" " 10 ".....	7	0	20
Carbolic acid solution 2%.....	Soaked seed 2 hours.....	0	0	55
" " ".....	" " 4 ".....	0	0	55
" " ".....	" " 6 ".....	0	0	55
" " ".....	" " 10 ".....	0	0	55
Ohlorine gas.....	In tight receptacle 3 hours.....	30	1	10
Corrosive sublimate (1-3000).....	Soaked seed 1/2 hour.....	100	2	4
Nothing.....	.....	100	10	0

will be noticed that the five per cent solution of chloride of lime destroyed 25 per cent of the seed but produced no effect on the amount of scab upon those that grow. When used dry in the hills, the injury was less severe, but only 10 per cent of the plants grew. The result, so far as the prevention of scab was concerned, seemed to be satisfactory, as all of the tubers were smooth. Formaldehyde gas also had an injurious effect upon the development of the seed, as after being treated with the gas in a closed receptacle for two hours, three-fourths of the seed failed to grow, and the plants that did develop were quite weak and spindling, and very few of the tubers were merchantable. The gas, however, seemed to be effective in preventing the

scab, as only one per cent were scab affected, while the untreated rows averaged 10 per cent. In the rows where the seed had been treated five and seven hours with formaldehyde gas, no plants appeared. One-half per cent formalin also seemed to have an injurious effect upon the development, as when seed was soaked for two hours a slight injury was noticed, and after twenty-four hours, only four per cent grew. A small amount of scab was found where the treatment ranged from two to six hours, but with the longer treatments no scab was apparent. The results with a one-half per cent solution of lysol were similar to those secured with formalin, except that the injurious effect upon the seed was more marked. When the two per cent solution of carbolic acid was used, none of the plants grew, and with chlorine gas, only twenty per cent of the plants grew, but the plants that did develop showed only slight traces of scab. Corrosive sublimate at the rate of one to two thousand and with the seed soaked one-half hour, seemed to have no injurious effect upon the growth of the plants, and reduced the per cent of scabbed tubers to two, as compared with ten where the seed was untreated.

As will be noticed in the column giving the cost of materials per acre, the corrosive sublimate treatment is cheapest of all, although the cost of the formalin treatment is not excessive. With the use of these materials, taking two hours as the maximum time for the treatment of the seed with formalin, the results seem satisfactory, and in sections where the crop is seriously affected with the scab, the use of either of them will be found profitable. As every one of the other treatments resulted in injury to the seed and partial or total loss of the crop, they cannot be recommended, especially as most of them are considerably more expensive than either formalin or corrosive sublimate. From the fact that corrosive sublimate is a poison, many have hesitated to use it, but as it can generally be secured at any drug store, while formalin can be found, as a rule, only in the larger towns, the former will undoubtedly be quite generally used. Corrosive sublimate can usually be obtained for eight or ten cents an ounce, and at about one-half this price in larger quantities, while formalin costs about fifty cents per pound. Experiments with the use of corrosive sublimate for the prevention of potato scab have now been carried on for five or six years, and the method of preparing and using it has several times been given, but as we have frequent inquiries regarding it, the directions are repeated.

The treatment should be made in a wooden vessel of some kind, and metal receptacles should always be avoided. For sixteen gallons of water take one ounce of corrosive sublimate, which should be moistened and made into a paste and dissolved in one gallon of boiling water before it is diluted. Fairly good results are secured when the seed, without previous preparation, is placed in this solution and allowed to remain from thirty to sixty minutes, but in case the seed is badly infected with the scab, it is advisable to soak it in clear water for one or two hours before placing it in the corrosive sublimate solution. The treatment is often given after the seed has been cut, but as the exposed flesh of the tubers is slightly injured by the treatment, it is advisable to soak the seed before cutting the tubers. Unless to be used within a day or two, care should be taken not to allow the tubers to remain in a deep pile, and in no case should they be placed in bins, boxes or bags in which potatoes have been stored, unless care is taken to disinfect them with the corrosive sublimate solution. One ounce of the corrosive sublimate will be sufficient for ten bushels of the seed, but as the strength of the solution is gradually reduced, it is

advisable to add one-half ounce of the corrosive sublimate after treating five bushels and repeating it until all have been treated.

The aid given by the bacteriologist, Prof. C. L. Marshall, in the way of advice and assistance in making the treatments, as well as the deep interest taken by him in the results, is greatly appreciated.

Several investigators have reported marked benefits from the use of sulphur as a preventive of potato scab, but our own tests do not justify this claim. As long ago as 1889, when the use of this material was first advocated, we made a thorough test of sulphur, using it at the rate of one hundred and fifty pounds per acre upon two varieties. When the tubers were dug many of them were coated with sulphur, but little if any benefit could be observed and, in one case, there were rather more scabby tubers where the sulphur had been used, than where the seed was planted without treatment. As a result of this experiment we have little faith in the efficacy of sulphur. As compared with corrosive sublimate, the particular claim that has been made for sulphur is that it is not poisonous, while a very small amount of corrosive sublimate would prove fatal to animals of any kind, but, even when sulphur is used at the rate of only one hundred and fifty pounds per acre, the cost would be so great that few would be likely to adopt it as a remedy, especially as corrosive sublimate for treating the seed for an acre of potatoes does not cost more than five cents and, if ordinary care is taken, there will be no danger from its use.

#### CO-OPERATIVE EXPERIMENTS WITH POTATOES.

For several years we have sent out a number of collections of the varieties that seemed most promising to thirty or forty persons in various parts of the state, in order that the varieties might be tested under varying conditions of soil and climate. We also aimed to thus distribute the new kinds, as the recipients were asked to share their first year's crop with their neighbors. In order that the reports might furnish similar data, blanks were sent with the seed on which the following points were to be noted: Date of planting, date of ripening, the distance of planting, the number of hills, the yield both of large and small, and the size and quality of the tubers. We give below the average of the reports we have received and readers can draw their conclusions as to the varieties likely to be of value in their section.

In order that the seed might be furnished to some of the representative farmers of each county, it was distributed through the secretaries of the various county institute societies, and it is understood that a report upon the varieties and an exhibition of the tubers will be made at the winter institutes.

The collections consisted of two pounds of about ten different varieties, the majority of which were comparatively new sorts, although some of the older standard kinds were included for comparison.

About fifty collections were sent out during April, 1898, and reports have been received from a majority of the parties, including:

Geo. W. Abbot, Alma.  
F. A. Bradley, Vassar.  
C. E. Crissman, Washington.  
H. H. Doane, Barron.  
Freeman Franklin, Buchanan.  
Walter Gorton, Howell.  
John M. Haven, Bloomingdale.

Chris Bernhart, Beechwood.  
Robert Brighton, Wyandotte.  
H. C. Dennison, Ada.  
E. E. Evans, Edward.  
F. E. Goodspeed, Ithaca.  
Wm. H. Gorsline, Battle Creek.  
C. S. King, Thornton.



Joseph Long, Bad Axe.  
H. A. Nichols, Hastings.  
James Russell, Creswell.  
W. C. Stewart, Fremont.  
Parley C. Thomas, Hemlock.  
Mark Turner, Huron.

John F. Muller, Wayne.  
O. A. Nummer, Ionia.  
Alonzo Stitson, Walled Lake.  
Fred A. Thatcher, Ravenna.  
O. S. Thompson, Allen.  
Frank Ward, Vermontville.

Dell Warren, Stanwood.

An average was taken from the reports of the above, which showed the following yields per acre in bushels:

<i>Variety.</i>	<i>Marketable.</i>	<i>Unmarketable.</i>	<i>Total.</i>
Abundance.....	241.95	24.5	236.45
Carman No. 1.....	251.2	21.3	272.5
Carman No. 3.....	248.7	14.7	263.4
Early Michigan.....	152.3	23.4	175.7
Early Norther.....	185.7	28.4	214.1
Early Peachblow.....	186.3	14.7	201.0
Early Thoroughbred.....	167.1	28.1	195.2
Livingston Banner.....	170.3	12.7	183.0
Maggie Murphy.....	181.4	17.2	198.6
Peachblow Seedling.....	280.	25.	305.
Rose No. 9.....	221.7	16.	237.7
Rose Standish.....	150.3	17.3	167.6

### RADISHES.

The forcing radishes are small in size and of quick maturity. The form differs from round-turnip to olive-shape or half-long tapering; the color from white or yellow to all shades of red, scarlet and crimson. Many sorts differing in name are almost identical, though usually slight differences in form or color distinguish the varieties.

#### *Varieties having round or turnip-shaped roots:*

*Earliest.* From D. Landreth & Sons. Tops small; root very dark garnet color; flesh greenish white, crisp and tender. The variety has a long season, but the very dark color is somewhat unattractive.

*In and Out.* An excellent bright, dark red sort with white tips.

*Leafless.* From J. J. H. Gregory, Marblehead, Mass. The tops are very small and a dark green color. The root is dark red, handsome in appearance, regular in form, and mild and pleasant in flavor. Unique in smallness of tops.

Table of varieties.

Variety	Seedsman.	Days to edible maturity.
All Seasons.....	Jas. Vick's Sons.....	29
Cardinal.....	W. H. Maule & Co.....	25
Cincinnati Market.....	J. C. Vaughan.....	32
Eighteen Day Forcing.....	J. A. Salzer.....	24
Earliest.....	D. Landreth & Sons.....	25
Erfurt.....	J. A. Salzer.....	29
French Breakfast.....	D. M. Ferry & Co.....	25
Gray Sommer.....	D. M. Ferry & Co.....	34
In and Out.....	J. A. Bruce & Co.....	28
Leafless.....	J. J. H. Gregory.....	28
Lily White Turnip.....	J. A. Bruce & Co.....	29
Long Scarlet Short Top.....	D. Landreth & Sons.....	35
Number Seventy-nine.....	H. W. Buckbee.....	30
Red Rocket.....	Peter Henderson & Co.....	26
Rose.....	D. M. Ferry & Co.....	27
Ruby Pearl.....	W. A. Burpee & Co.....	26
Strasburg.....	D. M. Ferry & Co.....	34
Twenty Day Express.....	J. Lewis Childs.....	24
Twenty Day Forcing.....	Johnson & Stokes.....	28
White Globe Forcing.....	H. A. Dreer.....	29
White Naples.....	D. M. Ferry & Co.....	36
White Rocket.....	Peter Henderson & Co.....	29
White Tipped Rocket.....	Peter Henderson & Co.....	24
White Summer Turnip.....	D. M. Ferry & Co.....	31
White Turnip Rooted.....	D. M. Ferry & Co.....	30
Yellow Summer Turnip Rooted.....	D. M. Ferry & Co.....	32

*Ruby Pearl.* From W. Atlee Burpee & Co. A very fine bright red sort. Perhaps the best of the turnip class grown here this season.

*Twenty Day Forcing.* From Johnson & Stokes. A very fine round sort with a slender white tap-root. Very attractive in appearance; crisp and of mild flavor.

*White Rocket, White Summer Turnip* and *White Turnip Rooted* are fine white sorts, mild and pleasant in quality. They are not so attractive as the bright colored varieties.

Of the varieties belonging to the olive-shaped class, *Red Rocket* and *Rose* gave the best satisfaction.

*Cardinal* and *Eighteen Day Forcing* have roots three to four inches long and one inch in diameter at base. Their bright red color is very attractive and their larger size and quick maturity make them preferable to the smaller sorts for forcing or outdoor planting.

*Long Scarlet Short Top* and *Cincinnati Market* are long rooted sorts well suited to the outdoor kitchen garden or for market purposes.

## SWEET CORN.

The trial plot of sweet corn was planted May 26. Thirty-one varieties, including many of the old sorts and some new ones which have not been described in our bulletins, were used: *Adams, White Cory, Champion, Concord, Country Gentleman* and *Stowell's Evergreen* are varieties that are familiar to most growers and need no further description.

Table of varieties, Sweet Corn.

Variety.	Seedsman.	Ears per square rod.	No. of days from planting to edible maturity.	Height of Stalks. Feet.	Average.		No. rows of kernels per ear.	Length of kernels. Inches.	Diameter of cob. Inches.	Weight of ears. Oz.
					No. of ears per stalk.	Length of ears. Inches.				
Adams .....	Wood & Sons .....	84.89	74	7.5	.6	6.2	10-14	.375	.875	5.6
Asylum .....	Landreth .....	91.92	84	7.5	.81	7.8	8-14	.375	1.125	6.7
Best of All .....	Buckbee .....	91.92	79	7.	.84	7.7	8	.375	.875	5.4
Beverly .....	Landreth .....	91.92	66	4.75	.76	6.65	8	.31	.875	5.06
Champion .....	Ferry .....	98.95	86	5.5	.88	6.8	12	.375	1.	6.2
Concord .....	" .....	77.86	76	6.	.63	7.2	12-14	.375	1.125	7.2
Country Gentleman .....	" .....	113.14	88	7.	1.06	7.4	12-16	.437	.875	5.9
Early Evergreen .....	" .....	84.89	76	7.	.83	7.	14-18	.375	1.25	7.6
Evergreen (Stowell's) .....	" .....	88.40	99	7.5	.73	7.2	12-14	.375	.875	6.4
First Crop .....	Rawson .....	98.95	69	4.	.85	6.5	8	.375	.75	5.6
First of All .....	Buckbee .....	113.14	53	6.	.97	8.3	12	.375	.875	7.
Gentry .....	Wood & Sons .....	84.89	101	9.	.75	8.6	12	.31	.875	7.2
Giant .....	Ferry .....	98.95	84	8.	1.	8.5	8-12	.375	1.125	8.2
Henderson .....	Henderson .....	42.41	97	6.	.63	7.6	10-12	.375	.875	6.4
Hickox .....	Steere .....	105.97	89	6.	.96	7.2	10-14	.312	1.	7.2
Indiana Wonder .....	Everitt .....	77.86	88	8.	.76	7.4	12-14	.312	1.	6.6
Lackey .....	Gregory .....	91.92	67	4.	.81	6.6	8	.375	.875	5.3
Maine .....	Vaughan .....	98.95	66	3.5	.9	6.4	8	.375	1.	4.8
Mammoth .....	" .....	77.86	94	6.5	.66	9.2	14	.375	1.125	8.8
Manhattan .....	Thorburn .....	102.46	53	3.16	1.	4.8	8	.312	.75	4.75
Maule XX .....	Maule .....	105.97	74	4.75	.86	7.8	8-14	.312	1.	7.8
Melrose .....	Thorburn .....	98.95	72	4.33	.66	6.2	10-12	.375	1.	6.
Northrup & King XXXX .....	Northrup, King & Co. ....	109.48	82	5.5	.81	6.6	12	.375	1.	7.2
No. 13 .....	U. S. Dep't .....	64.28	53	4.	.95	5.2	8-12	.312	.75	4.
Old Colony .....	Vaughan .....	102.46	74	6.	.88	7.2	10-14	.312	1.	6.7
Pennsylvania Rare Ripe .....	Wood & Sons .....	105.97	70	6.5	.91	9.4	8	.312	.75	6.7
Silver Coin .....	Livingston .....	120.17	84	7.	.92	7.2	14-20	.375	1.125	6.8
Telephone .....	Salzer .....	91.92	53	4.5	.77	6.45	8	.312	.875	5.04
Triumph .....	Rawson .....	88.41	88	7.	.71	9.	8	.375	.875	7.2
Washington Market .....	" .....	105.97	97	7.	.82	7.4	12-16	.437	1.	8.8
White Cory .....	Vaughan .....	95.43	57	3.75	.81	5.7	10	.375	1.	5.25

*Asylum*, one of Vaughan's medium varieties was not entirely satisfactory, but will be given further trial, as it has good-sized, well covered ears. The kernels were plump, broad, cream white, tender and quite sweet for an early sort.

*Best of All*, from Buckbee, is very much like White Cory, but it is somewhat later. The ears were of good size for eight-rowed corn, and well covered with broad, tender kernels of good length; cob small and white.

*Beverly*, from Landreth, was among the best early sorts. The ears were of only medium size, but they were well covered. The quality of the kernels, for corn of its season, is very good, and, though it lacked in the size of its ears, the delicious flavor makes it a desirable sort.

*Early Evergreen*, sent out by D. M. Ferry & Co., seems to occupy the place among early sorts that *Stowell* holds as a late variety. The ears mature at about the same time as *Concord*, but are a little larger, and the kernels are much like *Stowell's Evergreen*. The quality is superior to that of *Concord*.

*First Crop*, from Rawson, resembles *Cory*, but is not as good, as it smutted badly and the kernels were of poorer quality, but it is a fair, eight-rowed sort.

*First of All*, one of Buckbee's specialties, is of the *Concord* type. The ears are good-sized and well covered, kernels broad, deep, tender, sweet; cobs small, but some of them are red and color the kernels in cooking. This is a good medium early variety for home use, as its edible maturity is of long duration.

*Gentry*, sent out by T. W. Wood & Sons, is a large growing variety that resembles *Stowell's*. The ears are large, uniform and well covered with rich, cream colored kernels. While not superior to *Stowell's Evergreen*, it is a choice late variety. The stalks are strong and densely covered with long foliage, which makes it desirable as a fodder corn.

*Giant*, another of Ferry's novelties, is a late variety of good quality and some promise. The ears are very large, symmetrical and covered with broad cream white kernels of the highest quality; cob large and always white, which shows it to be a well selected variety. The stalks are strong growers and seem to stand dry weather.

*Henderson*, from Peter Henderson & Co., is a medium late sort, which reached edible maturity a little earlier than *Stowell*. The ears are very symmetrical, uniform in size and well covered; kernels broad, deep set, tender, milky, very white and have a sweet and delicious flavor. This promises to be a very desirable general purpose or market sort.

*Indiana Wonder*, from Everitt & Son, has slender ears and small kernels that resemble those of *Country Gentleman*, but are much shorter. The kernels are tender, sweet and milky, but some of the ears are not well covered, due probably to the condition of the weather at the time of setting.

*Lackey*, obtained from Gregory, proved to be a small growing sort of poor quality. The ears were short and poorly filled; kernels broad with a tough shell, and deficient in richness. It was badly smutted, which is against it as a cropper.

*Maine*, from J. O. Vaughan, grew much like *White Cory*, and was of about the same quality. It is a good extra early sort, but not a true sugar corn.

*Mammoth*, another variety from Vaughan, is one of the choice late standard varieties. The ears are large and are well filled with juicy, sweet, deep set, tender, cream white kernels. This variety should be in every garden, as it is a superior late sort.

*Manhattan*, from Thorburn, is a dwarf-growing variety which proved of no value, as both ears and stalks were badly smutted.

*Maule XX*, from Maule, has rather short stalks and closely resembles *Concord*, but it produces good sized ears, of good quality, a few days earlier than that variety. The kernels are very tender, plump and sweet and cover the entire cob. It promises to be a good general cropper.

*Melrose*, from Thorburn, is much like *Maule XX*, but is of inferior quality.

*Northrup, King & Co. XXXX*, grows a medium sized stalk which produces ears of high quality. They are very symmetrical in shape and are well covered with large, broad kernels. The kernels are deep-set, very tender and rich in sugar.

*Old Colony*, Vaughan, is a standard sort that needs no description and should always be found in a home or market garden, where a choice, prolific variety is desired.

*Pennsylvania Rare Ripe*, from Wood & Sons, resembles common flint corn, and as a table sort hardly finds a place among the numerous varieties of higher quality.

*Silver Coin*, one of Livingston's specialties, has a very strong growing stalk, well set with ears, which are of good size and well formed; kernels milk white, tender, juicy and of rich, delicate flavor. A medium late variety.

*Telephone*, Salzer, is a small variety much like Cory in size and quality.

*Triumph*, Rawson, has long, slim ears; kernels are tender and of good size, but they are not very sweet.

*Washington Market*, also from Rawson, is identical with Egyptian, as grown last year. In quality it is among the best, and it should be more generally grown as a late variety.

*No. 13*, from U. S. Dept. of Agriculture, is a small variety that was badly affected with smut. The ears are short and the kernels, which were badly mixed, were of medium quality and fairly rich in sugar, but of no established type.

*White Cory* is one of the best of the early sorts, while Hickox is among the varieties largely grown by market gardeners and for canning or drying. The kernels are of high quality, and shrink but little.

### TOMATOES.

The seed was sown in the forcing house March 29. The seedlings were transplanted April 24, and the plants were set out in the field June 6. The rows were six feet apart, and the plants four feet distant in the rows.

In the table below will be found the date on which the first fruit ripened; the number and weight of fruits produced on two plants to September 12, and in the next column the total amount of ripe fruit produced on the two plants during the season. The average weight of a single fruit is also given. By dividing the crop into two periods the earliness of the variety is more readily determined.

The "c" following the seedsman's name in the table indicates that the variety has been grown one year at the college and seed saved for the present test:

Table of varieties.

Variety.	Seedsman.	Date of first ripening	Fruit ripe Sept. 12.		Fruit ripe Oct. 17.		Average weight of a single fruit. Ounces.
			No.	Weight.	No.	Weight.	
Acme	College	Aug. 18	60	14 lb 14 oz.	106	28 lb. 4 oz.	4.26
Advance	"	" 18	132	20 " 6 "	199	81 " 14 "	2.56
Alexander	"	" 18	77	16 " 12 "	176	38 " 2 "	3.46
Atlantic	"	" 14	64	13 " 5 "	151	36 " 7 "	3.86
Beauty	"	" 23	89	14 " 8 "	73	24 " "	5.33
Burbank	Burpee	" 17					
Bright and Early	College	" 20	225	30 " 4 "	402	61 lb 12 oz.	2.46
Conference	Gregory	" 19	136	21 " 6 "	234	39 " 10 "	2.70
Daybreak	(College)	Sept. 6	3	14 " "	110	37 " "	5.38
Diadem	Childs (c)	Aug. 28	66	23 " 6 "	175	66 " 14 "	6.11
Dominion Day	Burpee	" 14	105	33 " 14 "	171	55 " 2 "	5.15
Dwarf Aristocrat	College	" 15	56	15 " "	185	50 " "	4.26
Dwarf Champion	"	" 25	88	15 " 7 "	178	36 " 13 "	3.80
Dwarf Golden Champion	Burpee	" 24	86	21 " 8 "	202	50 " 7 "	3.99
Earliest (select)	College	" 9	140	22 " 6 "	278	40 " 2 "	2.31
Earliest (round)	"	" 8	92	16 " 2 "	310	30 " 12 "	3.34
Earliest Market	Buckbee	" 20	110	26 " 10 "	200	47 " 6 "	3.76
Egyptian Yellow	College	" 17	142	29 " 12 "	243	51 " "	3.38
Fair, County	Buckbee	" 29	48	11 " 15 "	165	41 " 11 "	4.04
Fair, State	"	" 29	38	9 " 2 "	159	39 " 6 "	4.59
Fair, World's	"	" 23	77	18 " 15 "	156	37 " 1 "	3.80
Favorite	College	Sept. 2	25	11 " 14 "	139	65 " 12 "	7.57
Fifty Day	Fifty Day	Aug. 17	155	10 " 14 "	209	17 " 8 "	1.34
Fiji	College	" 28	48	13 " 4 "	152	45 " "	4.73
Freedom	Henderson	" 24	52	14 " 14 "	165	42 " 10 "	4.13
G. A. R.	Gregory	" 24	28	7 " 13 "	122	38 " 13 "	5.09
Golden Glory	Salzer	" 29	35	12 " 4 "	149	32 " 1 "	5.52
Golden Queen	College	Sept. 2	28	14 " 2 "	127	35 " 12 "	4.50
Golden Prize	Buckbee	Aug. 28	25	6 " 6 "	136	39 " 12 "	4.67
Honor Bright	Livingston(c)	Sept. 5	22	8 " "	166	44 " 6 "	4.37
Ignotum	College	Aug. 24	45	15 " 14 "	189	70 " 12 "	5.98
Lemon Blush	"	" 25	51	14 " 5 "	138	44 " 5 "	5.13
Lemon Yellow	Livingston(c)	Sept. 5	12	5 " 12 "	125	54 " 8 "	6.97
Logan Giant	Everitt	" 4	10	9 " 2 "	63	51 " 2 "	13.74
Lorillard	College	" 2	43	13 " 6 "	184	71 " 10 "	6.23
Novelty	"	" 2	20	7 " "	139	27 " 10 "	3.18
No. 106 (Johnson & Stokes)	"	" 3	44	22 " "	181	85 " 14 "	7.59
Ponderosa	"	" 8	2	1 " 12 "	51	26 " 2 "	7.87
Potato-leaf Ignotum	"	Aug. 29	32	9 " 14 "	151	66 " 2 "	7.00
Ruby	"	" 18	61	19 " 10 "	171	43 " 2 "	3.94
Seedling (W.Va. Ex. Sta.)	"	Sept. 6	4	3 " 2 "	31	19 " 4 "	9.93
Shah	"	" 2	29	10 " 14 "	99	43 " 6 "	7.01
Terra Cotta	"	Aug. 28	59	17 " 6 "	170	44 " 14 "	4.23
Trophy	Wood	" 28	24	8 " 12 "	157	65 " 13 "	7.38
Yellow Prince	Livingston	Sept. 2	19	6 " 14 "	125	43 " 2 "	5.89

Among the recent introductions which have not been previously described in our bulletins are the following:

**Burbank.** The foliage is of ordinary type, but smaller in size and closer in growth. The fruits are borne in clusters as are the cherry sorts, and are round, about one-half inch in diameter and bright red in color. The quality is very high. It is a valuable small fruiting sort for preserving.

**Conference.** The foliage and fruit are closely like Advance, but it is a week later in ripening. The fruits are slightly larger in size than that variety and the cell-walls are thicker.

**Dominion Day.** The fruits are of good size, bright red in color and ripen evenly without cracking. The form is somewhat irregular, but not enough so to injure its selling qualities. This variety gave the largest amount of fruit for the early market. A valuable early sort.

*Dwarf Golden Champion.* Similar in plant and foliage to Dwarf Champion. The fruits are more oblong and not so regular in form as those of Dwarf Champion. A good yellow sort

*Earliest Market.* The fruits are of medium size; some are round, but the greater number are somewhat irregular and ridged. The color is a bright red and the quality is good. A very good medium early variety.

*County Fair.* The growth of the foliage and plant is similar to Dwarf Champion. The fruits resemble those of Acme in form and color. The quality is high and the plants are productive. An excellent sort.

*State Fair.* Similar to County Fair in plant growth. The fruits resemble those of Dwarf Aristocrat, but will average larger in size. The upright habit of the plant and the good form and excellent quality of the fruit are the valuable points of this variety.

*World's Fair.* Appears almost if not quite identical with Dwarf Golden Champion in plant and fruit.

*Fifty Day.* An early ripening sort, bearing purplish red fruits. The variety is productive, but the size is too small to be of much value as a market tomato.

*Freedom.* Foliage and plant of the ordinary type. The fruits are round, smooth, and color evenly a bright red. Promising as a medium early market sort.

*G. A. R.* Foliage of ordinary type, but the leaflets are large. The fruits resemble those of Ignotum closely. Excellent in quality and a valuable sort.

*Golden Glory.* Fruit much like Golden Queen, but it will average larger in size and the form is more regular. It was earlier in ripening and the plants were more productive than those of Golden Queen. A most excellent yellow variety.

*Golden Prize.* Foliage somewhat similar to Dwarf Champion, but the plants are of more spreading growth. The fruits grow in clusters, are not so large as Golden Queen and have streaks of red about apex.

*Logan Giant.* Foliage closely of Ponderosa type, but the leaflets are smaller and lighter green. The walls are very thick and solid and the flesh is dark purplish red and of good quality. The unevenness in form is against it as a market tomato.

*Yellow Prince.* Foliage and plant of Dwarf Champion type, but of larger and stronger growth. The fruits closely resemble those produced by Dwarf Golden Champion but are larger, more solid and the form is more regular. A good yellow variety.

The following sorts have been grown for two or more seasons:

*Advance.* This variety has given excellent satisfaction for several seasons as a second early sort. The fruits, while not large, are regular in form, of good color and quality and the plants are productive.

*Bright and Early.* The fruits are somewhat similar to those of Advance, but are a brighter red in color and a week later in ripening. The plants were very productive and ripened a good proportion of the crop early.

*Earliest.* This variety has been grown for several years as a first ripening sort. It surely has a place to a limited extent, for this purpose. By systematic and careful selection for several seasons we have developed a superior strain of this variety. Atlantic and Ruby bear larger fruits, but are a week or ten days later in ripening.

*No. 105.* This variety is somewhat late in ripening, but the plants are very productive and the fruits large, of good color, quality and form. Valuable for productiveness and the large size of the fruits.

*Potato-leaf Ignotum.* The fruits are larger than those of Ignotum and the plants are as productive. Very desirable for market or for home use.

*Terra Cotta.* A variety having a thin, velvety skin and flesh of a rich red color and excellent quality. An excellent sort for home use.

#### SUMMARY OF VARIETIES.

*Earliest* is one of the best early ripening varieties. *Atlantic* and *Ruby* follow *Earliest* and the fruits are of larger size.

*Advances* is one of the best early kinds bearing small fruits. *Acme*, *Beauty*, *Dominion Day*, *Ignotum*, *Perfection* and *Potato-leaf Ignotum* are excellent for the general crop.

*Golden Queen* and *Golden Glory* are among the best yellow sorts.

Agricultural College, Mich.,

February 10, 1899.





## BUSH FRUITS FOR 1898.

BY L. R. TAFT AND H. P. GLADDEN.

Since the last report upon small fruits was issued, several varieties of raspberries and blackberries have been added to the collection and have been sufficiently tested to permit of a report upon their behavior. In the following bulletin notes upon these new sorts as well as upon a number of the older varieties are given. Although a large number of varieties have been introduced with high praise during the last five years, comparatively few have shown greater merit than was possessed by the older kinds; and, as will be noted from examination of the summary given under each of the fruits, the more valuable kinds for ordinary purposes are those that have been in cultivation from five to ten years;

## BLACKBERRIES.

Variety.	Vigor.	Date first ripe fruits	Date last fruit.	Productiveness.	Quality.	Number of berries to weigh 1 oz.
Early King.....	9.8	July 15	July 29	9.	8.5	10
Early Mammoth.....	8.	" 25	Aug. 12	5.	8.	7
Eldorado.....	6.5	" 21	" 10	2.	8.	14
Erie.....	9.5	" 23	" 10	6.	8.	13
Ford No. 1.....	8.5	" 21	" 10	6.5	8.	9
Jewett.....	9.2	" 23	" 10	5.	8.5	10
Kittatinny.....	9.8	" 23	" 17	5.	8.	10
Lincoln.....	9.5	" 22	" 12	8.	7.	17
Maxwell.....	8.	" 19	" 9	5.	9.	14
Reyner.....	9.	" 23	" 11	8.5	9.	14
Sanford.....	9.	" 25	" 15	9.	9.2	13
Snyder.....	9.5	" 22	" 16	8.5	8.5	12
Stone's Hardy.....	9.8	" 22	" 12	5.	8.5	14
Taylor.....	9.5	" 23	" 15	8.5	9.	11

*Early King.* The canes are of vigorous, upright growth and productive. The fruits are large and of good quality. It is early in ripening and the bulk of the crop is ready for market before Snyder and Taylor are ripe. Should be a profitable early market variety. It is somewhat tender and would suffer badly in a cold winter unless protected.

*Early Mammoth.* The fruits are very large, but so few are borne that the variety has little promise of commercial value. Over one-half of the growth was killed back by the winter.

*Eldorado.* In previous seasons this variety has been as hardy as Snyder. The past season, however, nearly all the growth was killed by the winter and but few fruits were borne.

*Lincoln.* Quite hardy and productive, but the fruits are very small and drop too easily from the bushes.

*Maxwell.* This was the first year of fruiting. The canes were not of strong growth and were quite badly injured by the winter. A few small and

imperfectly formed fruits that were of good quality were borne. Further trial is required to test the variety.

*Reyner*. This was the first crop borne. The variety is good in cane growth and seems to be quite hardy. The berries are short, conical, quite irregular in form, of good quality, but too small in size to be of value as a market berry. If the size of the fruit improves as the plants become older, it may become valuable.

*Sanford*. First berries borne this season. The canes are of strong growth. About one-third of the cane growth killed by the winter. The fruits are of much the appearance of *Snyder*, though scarcely as large. A good crop of fruit was borne and the variety seems of considerable promise. Further trial necessary.

*Snyder* and *Taylor* are old standard sorts that usually produce a good crop of fruit. The canes will stand an ordinary winter without serious injury.

### RASPBERRIES.

The tips of the canes of several varieties of raspberries were killed by the winter, but all had a sufficient amount of live cane growth to bear a full crop of fruit. The soil where the plants have been grown is one that dries out very easily and is underlain with quicksand which closely approaches the surface; the cane growth and productiveness are, therefore, not what they would be under more favorable conditions. The plants were sprayed with Bordeaux mixture when the young canes were about one foot high and the anthracnose was thus kept in check until the crop was harvested, when the old canes were removed and burned.

#### *Black and Hybrid Raspberries.*

##### ABBREVIATIONS.

Size.	Form.	Color.
s, small.	r, round.	b, black. g, glossy.
m, medium.	c, conical.	p, purple. l, light.
l, large.	o, ovate.	o, orange. pu, pubescent.

Variety.	Vigor.	Date bloom.	Date first ripe fruits.	Date last fruits.	Productiveness.	Size.	Form.	Color.	Quality.	No. of fruits to weigh 1 lb.
Black Diamond.....	7.5	June 2	July 8	July 24	5.	m	ro	b	8.8	28
Columbian.....	8.5	" 9	" 10	Aug. 3	9.	m	ro	b	8.5	16
Conrath.....	8.	" 1	" 4	July 20	8.5	l	r	p	8.	19
Edmunds.....	9.5	" 2	" 1	" 20	8.	l	r	g b	8.5	23
Eureka.....	9.2	" 1	" 1	" 23	9.	l	ro	b	8.	13
Gregg.....	9.	" 4	" 8	" 25	8.5	l	r	b pu	7.	21
Kansas.....	9.	" 2	" 1	" 20	8.5	l	r	g b	8.5	23
Lotta.....	9.5	" 4	" 6	" 24	8.5	l	ro	b	9.5	18
Munger.....	9.5	" 1	" 7	" 26	9.	l	ro	b	9.	16
Nemaha.....	9.	" 4	" 5	" 24	8.	l	r	b pu	7.5	20
Onondaga.....	8.5	" 1	" 4	" 21	7.5	m	ro	b	8.5	23
Palmer.....	7.5	" 1	June 29	" 18	8.	s	r	b	8.5	13
Pescharevsky No. 7.....	9.5	" 3	July 5	" 24	9.4	l	re	b	8.5	23
Smith (Giant).....	9.	" 1	" 5	" 24	9.	m	ro	b	8.	25
" (Prolific).....	9.5	" 3	" 3	" 21	8.5	m	ro	b	9.	26
Stabellin.....	9.5	" 1	" 2	" 23	8.	s	ro	b	7.	28
Shaffer.....	8.2	" 4	" 8	" 23	8.	l	rs	p	8.5	15

*Black Diamond.* Did not make as good a showing as last season. The canes were of weak growth and the few berries borne were below average size.

*Columbian.* Perhaps the best of the purple-cap class.

*Conrath.* An excellent medium early variety. Good in cane growth and productive of large-sized berries.

*Edmunds.* Plants from Ed. Reynolds, Owosso, Mich. The canes are of strong growth. The berries are medium to large in size, quite irregular in form, and of a jet black color, with flesh of good quality, dry but quite firm; they crumble very easily and can scarcely be picked without falling apart.

*Eureka.* This variety is good in cane growth and is quite productive. The berries are large in size, though not very firm or of high quality. It is early in ripening and is worthy of extensive planting by the market grower.

*Gregg.* An old variety largely planted as one of the best late sorts. The canes are somewhat tender and the variety should only be planted on a high, well-drained location.

*Kansas.* An excellent early to medium early variety. The canes are quite hardy and bear a good crop of large-sized fruits. One of the best market berries.

*Lotta.* Plants from Storrs & Harrison Co., Painesville, Ohio. The canes are of very strong growth. The berries are large in size and round conical in form. The color is a brownish black, giving the fruit a mottled appearance, that is not very attractive. The quality is high and the berries are firm. The plants were set in the spring of 1897. Further trial is necessary to test productiveness.

*Munger.* Received from Albaugh Nursery Co., Tadmor, Ohio, and set in the spring of 1897. The variety is excellent in cane growth and very productive for the age. The berries are large, regular in form and jet black in color with considerable fuzz between the seeds. The quality is high and the berries are very firm, making the variety an excellent shipper. A very promising late ripening sort.

*Onondaga.* Plants from C. Mills, Fairmount, N. Y., were set in the spring of 1897. Canes of fair growth. Berries of medium size, roundish conical in form, jet black in color and somewhat fuzzy between the seeds. The fruits are firm, rather dry, but of fair quality. A good variety but not of special merit.

*Palmer.* Usually one of the best market sorts. The past season the canes were of weak growth, unproductive and the berries of small size.

*Poscharsky No. 7.* Received from Poscharsky & Son, Princeton, Ill. The plants are strong and very productive of good sized fruits. The berries resemble Gregg in appearance but are better in quality. A very promising medium late sort. Plants set in the spring of 1897.

*Smith (Giant).* Plants from A. M. Smith, St. Catharines, Ont., were set in the spring of 1897, and have made an excellent growth. The berries are of medium size, regular in form, jet black in color, of fair quality and quite firm. A good variety, but it has nothing to specially recommend it.

*Smith (Prolific).* Canes of very vigorous growth. The fruits are only medium in size but of good quality. Productiveness medium.

*Stahelin.* Received from F. J. Stahelin, Bridgman, Mich. Plants set in the spring of 1897. The canes were of good strong growth but the fruits were very small in size. Of no value as grown this season. Further trial is necessary.

*Shaffer.* One of the best varieties for canning and home use. The canes are quite subject to the attack of anthracnose, and the variety is objectionable on that account. Fruits inclined to crush.

### Red Raspberries.

Variety.	Size. s, small. m, medium. l, large.	Vigor.	Date bloom.	Form. r, round. c, conical. o, ovate.	Date first ripe fruits.	Date last ripe fruits.	Productiveness.	Size.	Form.	Color.	Quality.	No. of fruits to weigh 1 lb.
Church.....	8.		June 3		July 2	July 23	7.	l	ro	do	8.5	18
Cuthbert.....	9.		" 11		" 3	" 28	8.5	l	ro	r	8.5	15
Kenyon.....	8.5		" 6		" 4	" 25	8.	l	ro	r	9.5	17
King.....	7.5		" 6		" 4	" 28	6.	l	ro	r	8.5	21
Loudon.....	8.5		" 6		" 3	" 28	8.	l	ro	do	9.5	16
Marlboro.....	8.5		" 8		June 24	" 19	8.5	m	r	r	7.5	19
Phoenix.....	8.		" 5		July 29	" 23	8.8	l	ro	dr	9.5	18
Stayman No. 1.....	8.5		" 11		July 16	Aug. 4	6.	l	ro	do	9.	14

*Church.* The fruits are very attractive in appearance and of good quality, but have the serious fault of falling to pieces when picked.

*Cuthbert.* This is probably the best red raspberry, all points considered, for market purposes.

*Kenyon* and *Loudon*, as grown here, appear to be identical. The fruits are large, very attractive in appearance, of high quality and firm. They may possibly prove to be better sorts than the old, reliable *Cuthbert* to plant for market.

*Marlboro.* Largely planted as an early variety.

*Phœnix.* The canes are not of very strong growth but are fairly productive. The fruits are of good size, rich dark red in color and of high quality. Early in ripening and a promising variety.

*Stayman No. 1.* Berries very large, rich dark red in color and of good quality. The canes are of upright growth and as they make but few laterals to bear fruit, the variety is low in productiveness.

### Summary.

The following varieties of raspberries, of those grown here, are the most promising for central Michigan:

#### Black Caps.

Palmer, closely followed in season by Eureka for early, Conrath and Kansas for medium season and Gregg for late. Of the newer sorts Edmunds is promising for early or second early and Munger, Lotta and Poscharsky No. 7 for late.

#### Purple Caps.

Columbian and Shaffer are probably the best of this class.

*Red Varieties.*

Cuthbert is still the leading sort of this class planted for late, though Loudon is coming rapidly to the front. Marlboro is most generally planted for early. Phoenix is a very promising second early variety for market or home use.

## GRAPES.

The season of 1898 was very favorable for the grape, and nearly all varieties set well with fruit.

*August Giant.* Bunch of medium size, irregular in shape, loose; berries large, round, black, covered with reddish bloom; skin thick and tough, juicy. The quality is rather poor, and the flavor foxy. Ripens the first of October.

*Belvidere.* Bunch medium to large, open, shouldered; berries of medium size, round, blue-black; skin thick, tough and fleshy. The quality is good and growth of plant strong and healthy. It is very productive and would probably be a good market variety. It is not a good keeper, as the grapes drop quickly from the stems. Ripens the last of September.

*Berckmans.* The vine is productive though not of strong growth. The clusters are not large but of good form. The grape is purplish-red in color and of fair quality. A good amateur variety, but of little value commercially. Ripens the last of September.

*Brighton.* This is probably the best red grape for home use or for market. The canes are of strong growth, quite healthy and productive and the grape is of high quality. Ripens the middle of September.

*Champion.* A black grape of some value as an early market variety. The quality is poor. Ripens the last of August.

*Chidester No. 3.* A young vine and but few clusters borne. Bunch of good size, oblong, usually shouldered, quite close and compact. Berries vary much in size, round, red with purple bloom. The quality is very good. Ripens the middle of September.

*Delaware.* An old sort of superior quality that should have a place in every home vineyard. The variety is quite subject to mildew and is not a strong grower. Ripens the last of September.

*Diamond.* The plants are hardy and productive; the clusters are of good size and compact in form. Berries large, yellowish-green in color and good in quality. An excellent variety for home use, or for market. Season a week earlier than Concord.

*Diana.* Plants are productive. Bunch compact. Berries of medium size and pale grayish-red color. The quality is very high. The variety is an excellent keeper but ripens in October, usually too late for most sections.

*Eldorado.* Vines seem to be hardy and are productive. Clusters of medium size, tapering, usually shouldered and quite compact. Berries are of medium size, round, yellowish-green in color, juicy; pulp tender, sweet. Excellent in quality and a good keeper. Ripens the first of September.

*Empire State.* In some sections a valuable white market grape. It is better in quality than Niagara, but not so large in bunch and berry. Ripens the last of September.

*Hayes.* An early white grape of superior quality. The canes are not of very strong growth and scarcely productive enough to make the variety of commercial value. Ripens from the first to the middle of September.

*Jessica.* A white grape ripening the last of August or the first of September. It is of fair quality and the canes are of good growth and productive. Of some value as an amateur variety.

*Moore Early.* The variety most largely grown as an early market grape. It is fairly productive, the clusters are of medium size, and the berries are large, black, but not of very high quality. Season two weeks earlier than Concord.

*Niagara.* Perhaps the leading white market grape. The vines are vigorous in growth, healthy and productive. The clusters and berries are large and the quality good. It is a little later in season than Concord.

*Pocklington.* An excellent yellowish white grape. A little earlier in season than Niagara. It is scarcely as productive as Niagara and the cluster and berry are smaller in size. The flavor is pleasant but somewhat foxy.

*Prentiss.* The cane growth is slender and rather weak. Clusters small, oblong, rounded at base, compact. Berries small to medium, varying greatly in size, slightly ovate in shape, greenish yellow color, with lighter bloom, skin thick and quite fleshy. The quality is good and it seems to be a good keeper. Hardly likely to prove of commercial value. Season the middle of September.

*Progress.* Strong and healthy in growth and productive. Clusters of medium size, broad at base, tapering and usually shouldered, compact. Berries of medium size, black, covered with deep blue bloom. The productiveness and form of bunch and berry make it a good market grape. The quality is low and the flavor foxy. Season the first of September.

*Superb.* A young vine and but few clusters were grown; these were of medium size, broad at base, tapering, usually quite open. Berries medium in size, round, black. The quality is high. Ripens the first of September.

*Vergennes.* Vigorous and healthy in growth. Clusters large and compact. Berry large, dark purple color, with green markings. The quality is good and the variety is valuable for its late keeping qualities. Season the last of September.

*Witt.* Vine young but producing some very good clusters. Bunch of medium size, usually shouldered, broad at base and tapering. Berries of fair size, round, yellowish white color, sweet and of high quality. Appears to be an excellent variety for home use. Season the first of September.

*Winchell.* The variety is strong and healthy in growth and productive of good sized clusters compact in form. Berries of medium size, round, color light green, skin thin but firm, pulp sweet and of very good quality. Perhaps the best early white grape for home use or for market. Ripens the first of September.

*Worden.* Probably the best black grape for home use or for market. It is a week or ten days earlier than Concord, fully as productive and better in quality.

Agricultural College, Mich.,  
February 10, 1899.

MICHIGAN  
STATE AGRICULTURAL COLLEGE  
EXPERIMENT STATION

DEPARTMENT OF  
BACTERIOLOGY AND FARM HYGIENE

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172--Combating Disease-Producing Germs  
173--Killing the Tubercle Bacillus in Milk

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BY CHARLES E. MARSHALL

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AGRICULTURAL COLLEGE, MICHIGAN  
1899



*The Bulletins of this Station are sent free to all newspapers in the State and to such individuals interested in farming as may request them. Address all applications to the Secretary, Agricultural College, Michigan.*

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## SUB-STATIONS

Grayling, Crawford County, 80 acres deeded.  
 South Haven, Van Buren County, 10 acres rented; 5 acres deeded.

## FERTILIZER ANALYSES.

The law providing for the inspection of commercial fertilizers and to regulate the sale thereof, was enacted fourteen years ago. The full text of the law is here inserted:

SECTION 1. *The People of the State of Michigan enact*, That any person or persons who shall sell or offer for sale in this State any commercial fertilizer, the retail price of which exceeds ten dollars per ton, shall affix on the outside of every package containing such fertilizer a plainly printed certificate, stating the number of net pounds therein; the name or trade mark under which such article is sold; the name of the manufacturer; the place of manufacture, and a chemical analysis, stating the percentage of nitrogen in an available form; of potash soluble in water and of phosphoric acid in available form (soluble or reverted) and the insoluble phosphoric acid.

SEC. 2. Before any commercial fertilizer is sold or offered for sale, the manufacturer, importer or party who causes it to be sold or offered for sale within this State, shall file with the secretary of the State Board of Agriculture a certified copy of the analysis and certificate referred to in section one, and shall also deposit with said secretary a sealed glass jar containing not less than two pounds of such fertilizer, with an affidavit that it is a fair sample of the article thus to be sold or offered for sale.

SEC. 3. The manufacturer, importer, or agent of any commercial fertilizer, the retail price of which exceeds ten dollars per ton as aforesaid, shall pay annually to the secretary of the State Board of Agriculture, on or before the first day of May, a license fee of twenty dollars for each and every brand of fertilizer he offers for sale in this State: *Provided*, That whenever the manufacturer or importer shall have paid this license fee his agents shall not be required to do so.

SEC. 4. All such analyses of commercial fertilizers required by this act shall be made under the direction of the State Board of Agriculture and paid for out of the funds arising from the license fees provided for in section three. At least one analysis of each fertilizer shall be made annually.

SEC. 5. The secretary of the State Board of Agriculture shall publish in his annual report a correct statement of all analyses made and certificates filed in his office; together with a statement of all moneys received for license fees, and expended for analysis. Any surplus from license fees remaining on hand at the close of the fiscal year shall be placed to the credit of the experimental fund of said board.

SEC. 6. Any person or persons who shall sell or offer for sale any commercial fertilizer in this State without first complying with the provisions of sections, one, two, and three of this act, or who shall attach or cause to be attached to any such package or fertilizer an analysis stating that it contains a larger percentage of any one or more of the constituents or ingredients named in section one of this act than it really does contain shall, upon conviction thereof, be fined not less than one hundred dollars for the first offense, and not less than three hundred dollars for every subsequent offense, and the offender shall also be liable for damages sustained by the purchaser of such fertilizer on account of such misrepresentation.

SEC. 7. The State Board of Agriculture by any duly authorized agent is hereby authorized to select from any package of commercial fertilizer exposed for sale in this State, a quantity, not exceeding two pounds, for a sample, such sample to be used for the purposes of an official analysis and for comparison with the certificate filed with the secretary of the State Board of Agriculture and with the certificate affixed to the package, on sale.

SEC. 8. All suits for the recovery of fines under the provisions of this act shall be brought under the direction of the State Board of Agriculture.

Approved March 10, 1885.

## OBJECT OF INSPECTION OF COMMERCIAL FERTILIZERS.

The law does not prescribe any standard for the composition of a commercial fertilizer, the manufacturer being free to make his own standard, the law simply requiring that the fertilizers offered for sale shall be up to the standard set up by the manufacturer. The license to sell does not certify to the value of the fertilizer, but simply states that the manufacturer or dealer offers for sale a fertilizer for which a certain content of nitrogen, potash and phosphoric acid is claimed, and that samples of such fertilizers have been deposited with the secretary of the college with affidavit regarding the composition. Analysis is then made of each of these fertilizers, gathered in the open market as far as possible, and the results of such analysis published in bulletin. The *claimed* composition and *found* composition are arranged in parallel lines, so that the real composition can be compared at a glance with the composition claimed for it by the manufacturer. In this way the buyer can see at once by this bulletin whether the fertilizer is as good as the claims made for it.

## RESULTS REACHED BY INSPECTION.

The quality of the fertilizers sold in this State has greatly improved within a few years past. On comparing the composition as "claimed" with that "found" by analysis, it will be seen that in only a few cases does the minimum claim exceed the amount actually found and in many cases the amount found exceeds the highest amount claimed. The day when a mixture of leached ashes and soap-boilers' waste can be sold for superphosphate or marl palmed off for Buckeye phosphate has passed away in Michigan.

## WHAT DO COMMERCIAL FERTILIZERS CONTAIN?

The first question one asks about a new article is, "What is it made of?" and the second is, "Will a material of such composition and at the stated cost, give me a profit when used on my farm?"

Commercial fertilizers contain a variety of substances, but only three of such importance that the farmer can afford to buy them at the prices charged for concentrated manures. They often contain lime, magnesia, silica, oxide of iron, sulphates, chlorides, etc., many of these of value as manures, but they can be bought for less money than is charged for the commercial fertilizers. The fertilizers may contain all these, but we buy them because they contain in addition one or more of three materials, viz., potash, phosphoric acid, and active nitrogen. It is the presence of these materials that gives commercial value to fertilizers. If the dealer boasts that his manure also contains alumina, silica, oxide of iron, lime and magnesia, the sufficient answer is that these materials make up the mass of all soils, and that the farmer buys his land by the acre and not by the ton. The only manurial materials that a farmer can afford to buy at prices demanded for fertilizers are these three most necessary, most precious, and most easily exhausted elements of plant growth—the tripod of agriculture. In the absence of any one of these three materials no plant can grow to perfection, and if the supply of them is below the needs of any given plant, that deficiency limits the crop proportionally. However abundant all the other elements of plant life, nothing will make up for the lack of any one of these three substances.

## LEADING KINDS OF FERTILIZERS.

The leading kinds of fertilizers may be classified as follows:

1. *Complete Manure*, which contains nitrogen in some combination, such as a salt of ammonia, nitrate of soda, or organic nitrogen; potash, as muriate or sulphate (German Stassfurth salts) or wood ashes; and phosphoric acid as a phosphate of lime. It is called a complete manure because it contains all of the three materials most essential for plant growth, and most likely to be deficient in a field after long cropping.

2. *Plain Phosphate*, which may be in the form of superphosphate, soluble in water or solution of citrate of ammonia, these being called available, because they are readily taken up by the roots of plants; and ground phosphate rock, an insoluble form. The bone phosphate and rock phosphate are changed into superphosphate by the action of sulphuric acid, removing a part of the lime, as sulphate.

The soluble phosphate is especially beneficial to plants in the early state of their growth, giving them a good start. In later stages of growth when the plant by its roots can forage for food in the soil, the insoluble phosphate may have nearly as beneficial an effect.

Phosphates promote the formation of flower and fruit and secure earlier ripening. They may wisely be used on vines and succulent fruits that are liable to be cut by early frosts in autumn, securing early crops with better prices and avoiding the loss of the entire crop by untimely frosts before the most of the crop had ripened. Fruit trees sometimes blossom year after year without producing fruit. This is often caused by storms at the period of flowering, but it may be caused by constitutional weakness, in consequence of which pollen of vital power is not formed. In such cases the use of active phosphates is worthy of trial.

3. *Bone Meal* contains phosphate of lime and animal matter rich in nitrogen, and hence is very valuable for manure where we desire a prolonged influence. It is well adapted to grass lands and lawns, and is free from the bad odor often given off by mixed fertilizers. Moist meadows are benefited by a dressing of bone meal. If the bones that now adorn the back yard and pasture lot should be ground into a powder and scattered on a crop-worn field, the results would surprise some farmers.

4. *Potash Manure*. The best and cheapest is that neglected home product—wood ashes. These contain an average of five per cent of potash, besides a sensible amount of phosphate, and a very large amount of carbonates of lime and magnesia; they are an all-round plant manure so far as mineral matter is concerned, supplying each ash element.

Unless the farmer can bring into active form the great store of potash in his soil, he will then have to buy the German potash salts, the muriate or sulphate. These salts are yearly coming into greater prominence as potash fertilizers, but their sale in Michigan in separate form has not been large.

The influence of potash on plant life is masterful; no plant can grow without it, and its influence in developing the carbohydrates, and maturing fruits, is marked and apparently controlling.

5. *Nitrogen Compounds*. Nitrogen is the bottled wine of the vegetable feast. If the term stimulant can be applied to any organization destitute of a nervous system, then nitrogen is the stimulant of plant life. In any of its combined forms it gives depth of color and exuberance of growth

to vegetable life, and when in abundant supply it causes the plant to break forth into riotous growth. The great reservoir of nitrogen is the air, but the leaves of plants though constantly bathed in nitrogen, cannot drink in a particle. It is only *nitrogen in combination* that can be appropriated by the plant, and this enters the plant by the roots and comes from the soil. A small amount is brought to the soil by the rain, washing out the ammonia and nitrates of the air, but the amount is not large, and entirely inadequate to supply a crop.

A large amount of active nitrogen in the form of nitrates is yearly formed in every well cultivated field, and this is the cheapest way of securing a supply of this costliest element of plant growth. The raising of leguminous crops, like the clovers, is the next cheapest way of securing a supply.

Combined nitrogen is purchased in three forms; salts of ammonia, nitrate of soda, and organic nitrogen in the form of dried blood, fish scraps, cotton seed meal, etc.

6. *Tankage*, is a complex and variable material obtained from the waste residues at the slaughter houses, the garbage collected by the scavengers in cities, etc. These materials are dried, the grease extracted in tanks and this tankage by itself, or mixed with phosphates, potash, etc., is sold as a fertilizer. It is mainly used to give bulk to the concentrated fertilizers made from bone and rock phosphate.

#### LIME.

Following nitrogen, potash and phosphoric acid, the next most important material is lime. In soils made by the decomposition of granite rocks, the soil is apt to be deficient in lime. This is manifest in the New England states. In most of the counties of our lower peninsula where the soil is classed in the drift formation, lime is an abundant element in the soil. It is easy to determine this by an examination of the well water. Our water comes by the rain, and is soft, but soaking into the ground it dissolves more or less of the mineral matter of the soil. If the well water of any region is *very hard* as shown by its action on soap, the hardness being caused by the lime dissolved in the water, such soil contains enough lime to supply the needs of crops. Lime may be used in such regions to decompose muck and flocculate clay, but is not required to feed the crops.

#### SCHEDULE OF COMMERCIAL PRICES.

The following prices per pound for fertilizing materials may be used in estimating the commercial value:

	Per pound.
Nitrogen in nitrates.....	13 c
Nitrogen in ammonia salts.....	14 c
Organic nitrogen in meat, blood, etc.....	14 c
Organic nitrogen in fine bone and tankage.....	13½c
Organic nitrogen in medium bone and tankage.....	10 c
Organic nitrogen in coarse bone and tankage.....	8 c
Phosphoric acid, available.....	4½c
Phosphoric acid, insoluble, in fine bone and tankage.....	4 c
Phosphoric acid insoluble, medium bone and tankage....	3½c
Potash as muriate.....	4½c
Potash as sulphate and in wood ashes.....	5 c

In the table of analysis the results are given as so many parts in a hundred.

Since there are 20 times 100 pounds in a ton, if we multiply the value of one pound by 20 we find the value of one percent of any material in a ton. We may thus construct a table for estimating the value of any materials found in the results of analysis. One per cent means 20 pounds in a ton, and if the material is worth 5 cents a pound, then each per cent equals \$1.00 for a ton.

#### COMMERCIAL VALUE AND AGRICULTURAL VALUE.

The commercial value and the agricultural value are not identical. The commercial value merely represents the cost of the material to make the fertilizer, if any one should attempt to make his own. The agricultural value or the benefit from the use of such fertilizer will depend upon a variety of conditions, such as the kind of soil, the crop, the season, the tillage, time of application, etc., etc. Let no one suppose that the estimate of the commercial value is a guarantee of a corresponding profit by its use on the farm. It may serve, however, as a basis of comparison between different brands of fertilizers. The reliable test of the value is determined by its use on a given soil and crop—worth more than all theoretical discussions and deductions. Yet there are certain general considerations which go to show the probable benefit of any fertilizing element when used on a certain kind of soil and crop, which will be of some benefit in selecting a fertilizer.

#### TERMS EXPLAINED.

In the table giving the results of analysis of commercial fertilizers there are certain terms used which require explanation: "Available nitrogen, estimated as ammonia;" under "Phosphoric acid" the terms "Available  $P_2 O_5$ ," "Insoluble  $P_2 O_5$ ," "Total  $P_2 O_5$ ," and "Potash soluble in water, estimated as  $K_2 O$ ."

Nitrogen may exist in available form either as a salt of ammonia, a nitrate, or in organic material such as dried blood, and be equally valuable in these several forms. But for ease of comparison in different manures chemists estimate it as if all these forms of nitrogen existed in the form of ammonia. Chemists estimate the compounds of phosphorus in manures as anhydrous phosphoric acid,  $P_2 O_5$ ; that is, phosphoric acid deprived of water; when this anhydride combines with water, the acid is formed. Thus if three molecules of water are added to one of  $P_2 O_5$ , two molecules of phosphoric acid are formed  $3H_2O + P_2 O_5 = 2 H_3 PO_4 =$  phosphoric acid. The  $P_2 O_5$  in separate form does not exist in any soil, but this expression is chosen because the amount of this combination of phosphorus is easily indicated, without considering what material the acid may be combined with. "Available  $P_2 O_5$ ," signifies the per cent of the acid in a form directly usable by the plant: "Insoluble  $P_2 O_5$ ," the per cent of acid in the condition of phosphate rock. By adding together the "Available" and "Insoluble" we get the "Total  $P_2 O_5$ ."

The "Potash soluble in water, estimated as  $K_2 O$ ," is the soluble potash salt estimated only as regards the oxide of potassium =  $K_2 O$ =oxide of kalium or potassium.

*Results of analysis of commercial fertilizers*

Manufacturer.	Trade name.	Dealer and locality.
Armour & Co., Chicago, Ill.....	Bone, Blood and Potash.....	{ Mohr Hardware Co., West Bay City..... }
Armour & Co., Chicago, Ill.....	Bone Meal.....	Farmers' Elevator Co., Lenox..
Armour & Co., Chicago, Ill.....	Grain Grower.....	{ T. McLaughry, Romulus..... A. R. Hahn, Utica..... }
Armour & Co., Chicago, Ill.....	All Soluble.....	Farmers' Elevator Co., Lenox..
Armour & Co., Chicago, Ill.....	Ammoniated Bone with Potash	T. McLaughry, Romulus.....
Armour & Co., Chicago, Ill.....	Fruit and Root Crop Special..	{ Mohr Hardware Co., West Bay City..... }
Armour & Co., Chicago, Ill.....	Star Phosphate.....	Manufacturer.....
Armour & Co., Chicago, Ill.....	Phosphate and Potash.....	M. & J. McLaughlin, Jackson..
Armour & Co., Chicago, Ill.....	Wheat, Corn and Oats Special.	M. & J. McLaughlin, Jackson..
James Boland, Jackson, Mich.....	Blackman.....	Jas. Boland, Jackson.....
Bradley Fertilizer Co., Boston, Mass.....	Dissolved Bone with Potash...	J. A. Cozadd, Wayne.....
Bradley Fertilizer Co., Boston, Mass.....	Niagara Phosphate.....	J. A. Cozadd, Wayne.....
Bradley Fertilizer Co., Boston, Mass.....	Potato and Root Phosphate...	Richmond Elevator Co., Lenox..
Bradley Fertilizer Co., Boston, Mass.....	{ Dissolved Bone, "Justice" Brand"..... }	W. M. Hart, Smith's Creek....
Bradley Fertilizer Co., Boston, Mass.....	B. D. Sea Fowl Guano.....	W. M. Hart, Smith's Creek....
Bradley Fertilizer Co., Boston, Mass.....	Alkaline Bone and Potash.....	W. M. Hart, Smith's Creek....

for 1899, expressed in parts in a hundred.

	Available nitrogen. Estimated as ammonia.	Phosphoric acid.			Potash soluble in water, esti- mated as K <sub>2</sub> O.
		Available.	Insoluble.	Total.	
{ Claimed..... { Found.....	5 to 6 4.65	8 to 10 9.35	1.5 to 2.5 1.70	9.5 to 12.5 11.05	7 to 8 9.19
{ Claimed..... { Found.....	3 to 4 4.19	9.93	12.93	24 to 28 22.86	
{ Claimed..... { Found.....	2 to 3 2.17	8 to 10 10.18	1.5 to 2.5 2.93	9 to 12.5 13.11	2 to 3 2.50
{ Claimed..... { Found.....	3.5 to 4.5 4.19	8 to 10 8.38	1.5 to 2.5 6.02	9 to 12.5 14.40	4 to 5 2.55
{ Claimed..... { Found.....	3 to 4 3.81	6 to 8 5.59	1.5 to 2.5 5.84	7.5 to 10.5 11.43	2 to 3 2.46
{ Claimed..... { Found.....	2 to 3 3.52	8 to 10 9.25	1.5 to 2.5 3.28	9 to 12.5 12.53	5 to 6 7.55
{ Claimed..... { Found.....		12 to 16 16.34	2 to 3 2.07	14 to 19 18.41	
{ Claimed..... { Found.....		10 to 12 12.91	2 to 3 3.87	12 to 15 16.78	2 to 3 1.87
{ Claimed..... { Found.....	1 to 2 1.80	8 to 10 8.97	1.5 to 2.5 3.47	9.5 to 12.5 12.44	1 to 2 2.05
{ Claimed..... { Found.....	1.14 1.01	3.86 1.95	2.06 4.10	5.94 6.05	2.51 4.16
{ Claimed..... { Found.....	1 to 2 1.61	8 to 10 8.20	2 to 3 2.76	10 to 13 10.96	2.15 to 3.25 2.05
{ Claimed..... { Found.....	1 to 2 1.44	7 to 9 7.98	1 to 2 2.70	8 to 11 10.68	1.06 to 1.65 1.25
{ Claimed..... { Found.....	1 to 2 1.54	8 to 10 8.49	2 to 3 2.61	10 to 13 11.10	3 to 4 2.75
{ Claimed..... { Found.....		12 to 15 12.51	1 to 2 2.29	13 to 17 14.80	
{ Claimed..... { Found.....	2.5 to 3.5 2.70	8 to 10 8.57	2 to 3 4.13	10 to 13 12.70	1.5 to 2.5 1.28
{ Claimed..... { Found.....		11 to 13 11.07	1 to 2 2.09	12 to 15 13.16	2.43 to 3.50 2.28



*Results of analysis of commercial fertilizers*

Manufacturer.	Trade name.	Dealer and locality.
Chicago Fertilizer Co., Chicago, Ill.....	Bone, Blood and Potash.....	Geo. B. Terry, Dryden.....
Cleveland Dryer Co., Cleveland, Ohio.....	Potato, Tobacco and General Crop.....	R. T. Knight, Pontiac.....
Cleveland Dryer Co., Cleveland, Ohio.....	XXX Phosphate and Potash..	E. W. Spencer, Petersburg....
Cleveland Dryer Co., Cleveland, Ohio.....	Phospho Bone.....	E. W. Spencer, Petersburg....
Cleveland Dryer Co., Cleveland, Ohio.....	Horsehead Phosphate.....	E. W. Spencer, Petersburg....
Cleveland Dryer Co., Cleveland, Ohio.....	XXX Superphosphate.....	R. T. Knight, Pontiac.....
Cleveland Dryer Co., Cleveland, Ohio.....	Ohio Seed Maker and Potash..	E. W. Spencer, Petersburg....
Cleveland Dryer Co., Cleveland, Ohio.....	Ohio Seed Maker.....	R. T. Knight, Pontiac.....
Crocker Fertilizer Co., Buffalo, N. Y.....	General Crop Phosphate.....	H. W. Harvey, Utica.....
Crocker Fertilizer Co., Buffalo, N. Y.....	Sugar Beet Manure.....	C. Goddeyne, Bay City.....
Crocker Fertilizer Co., Buffalo, N. Y.....	Special Sugar Beet Fertilizer.	C. Goddeyne, Bay City.....
Crocker Fertilizer Co., Buffalo, N. Y.....	New Rival Ammoniated Superphosphate.....	Michigan State Chicory Co., Bay City.....
Crocker Fertilizer Co., Buffalo, N. Y.....	Universal Grain Grower.....	W. H. Harvey, Utica.....
Detroit Sanitary Works, Detroit, Mich.....	Clover Leaf.....	Wm. Green, Wayne.....
Detroit Sanitary Works, Detroit, Mich.....	Superior Potato.....	Wm. Green, Wayne.....
Farmers' Union Fertilizer Co., Buffalo, N. Y.....	Club and Grange Formula.....	J. M. Preston, Macomb.....
Farmers' Union Fertilizer Co., Buffalo, N. Y.....	Potato, Tobacco and Truck Manure.....	H. A. Miller, Beddow.....
Farmers' Union Fertilizer Co., Buffalo, N. Y.....	Standard Phosphate.....	H. A. Miller, Beddow.....

for 1899, expressed in parts in a hundred.

	Available nitrogen.	Phosphoric acid.			Potash soluble in water, esti- mated as K <sub>2</sub> O.
	Estimated as ammonia.	Available.	Insoluble.	Total.	
{ Claimed..... { Found.....	1.83 to 3.04 3.03	9 to 12 11.16	1 to 2 5.61	10 to 14 15.77	2 to 4 5.26
{ Claimed..... { Found.....	1.25 to 2.5 1.66	10 to 12 10.14	1 to 2 2.85	11 to 14 12.99	6 to 7 5.18
{ Claimed..... { Found.....		12 to 14 11.98	1.87	13.85	5 to 6 4.69
{ Claimed..... { Found.....	1 to 2 1.26	10 to 12 11.62	2.82	14.44	1 to 1.5 1.23
{ Claimed..... { Found.....		10 to 12 11.21	3.06	14.27	
{ Claimed..... { Found.....		13 to 15 12.81	2.59	15.20	
{ Claimed..... { Found.....	2 to 3 2.32	10 to 12 9.64	3.10	12.74	2 to 3 1.43
{ Claimed..... { Found.....	2 to 3 2.00	10 to 12 9.72	3.69	13.41	
{ Claimed..... { Found.....	1 to 2 1.25	7 to 10 7.02	1 to 2 2.29	8 to 12 9.31	1.08 to 2.50 1.31
{ Claimed..... { Found.....	1.5 to 2.5 1.67	7 to 9 7.05	1 to 2 1.96	8 to 11 9.01	1.5 to 2.5 3.36
{ Claimed..... { Found.....	2.5 to 3.5 2.89	8 to 10 7.18	1 to 2 2.96	9 to 12 10.14	4.5 to 5.5 5.06
{ Claimed..... { Found.....	1.5 to 2.5 1.90	10 to 12 9.63	1 to 3 2.31	11 to 15 11.94	1.6 to 3.0 1.59
{ Claimed..... { Found.....	1 to 2 1.21	7 to 10 8.25	1 to 2 1.83	8 to 12 10.08	2.7 to 4 2.96
{ Claimed..... { Found.....	3.34 to 4.25 2.92	6 to 9 8.81	1 to 3 2.07	7 to 12 10.88	2.70 to 3.5 3.59
{ Claimed..... { Found.....	4.25 to 5.45 3.75	6 to 8 7.64	1 to 3 2.01	7 to 11 9.65	4 to 5 4.92
{ Claimed..... { Found.....	1 to 2 1.40	8 to 10 8.03	1 to 2 2.40	9 to 12 10.43	1.08 to 2.16 1.11
{ Claimed..... { Found.....	2.25 to 3.25 2.58	9 to 11 8.92	1 to 2 2.11	10 to 13 11.03	4 to 5 3.83
{ Claimed..... { Found.....	1.5 to 2.50 1.56	9 to 11 9.59	1 to 2 2.35	10 to 13 11.94	2 to 3 1.68

*Results of analysis of commercial fertilizers*

Manufacturer.	Trade name.	Dealer and locality.
Farmers' Union Fertilizer Co., Buffalo, N. Y. ....	Dissolved Bone and Potash....	Manufacturer.....
Jarecki Chemical Co., Sandusky, Ohio.....	Dissolved Bone Black Wheat Special .....	T. McClaughry, Romulus.....
Jarecki Chemical Co., Sandusky, Ohio.....	Fish and Potash Tobacco and Potato Food.....	J. H. McMann, Richmond.....
Jarecki Chemical Co., Sandusky, Ohio.....	Fish and Potash Grain Special.	R. C. Bialy, Bay City.....
Jarecki Chemical Co., Sandusky, Ohio.....	Lake Erie Fish Guano.....	R. C. Bialy, Bay City.....
Jarecki Chemical Co., Sandusky, Ohio.....	C. O. D. Phosphate.....	Manufacturer.....
Jarecki Chemical Co., Sandusky, Ohio.....	Number One Fish Guano.....	R. C. Bialy, Bay City.....
Lister Agricultural Chemical Co., Newark, N. J. ....	Success.....	A. R. Hahn, Utica.....
Michigan Carbon Works, Detroit..	Red Line Complete Manure....	{ Jenison Hardware Co., Bay City..... Schneider & Reindel, Frazer.. }
Michigan Carbon Works, Detroit..	Red Line Crop Grower.....	Schneider & Reindel, Frazer...
Michigan Carbon Works, Detroit..	Homestead, a Bone Black.....	Schneider & Reindel, Frazer...
Michigan Carbon Works, Detroit..	{ Red Line Phosphate with Potash .....	Richmond Elevator Co., Lenox.
Michigan Carbon Works, Detroit..	Homestead Potato Grower....	Richmond Elevator Co., Lenox.
Michigan Carbon Works, Detroit..	Homestead Lawn Fertilizer...	{ A. J. Brown Seed Co., Grand Rapids..... }
Michigan Carbon Works, Detroit..	{ Red Line Ammoniated Phos- phate .....	Manufacturer.....
Michigan Carbon Works, Detroit..	Banner Dissolved Bone.....	Manufacturer.....
Michigan Carbon Works, Detroit..	{ Homestead Sugar Beet Fer- tilizer..... }	Farm Department M. A. C.....
Niagara Fertilizer Co., Buffalo, N. Y. ....	Wheat and Corn Producer....	T. McClaughry, Romulus.....

for 1899, expressed in parts in a hundred.

	Available nitrogen.  Estimated as ammonia.	Phosphoric acid.			Potash soluble in water, esti- mated as K <sub>2</sub> O.
		Available.	Insoluble.	Total.	
{ Claimed..... { Found.....	----- -----	8 to 10 7.58	1 to 2 1.84	9 to 12 9.42	2 to 3 2.72
{ Claimed..... { Found.....	----- -----	16 to 18 15.03	1 to 2 1.89	17 to 20 16.92	----- -----
{ Claimed..... { Found.....	1 to 2 1.33	9 to 10 9.73	1 to 2 2.06	10 to 12 11.79	4 to 5 4.77
{ Claimed..... { Found.....	1.45 to 1.95 1.76	9 to 10 9.37	1 to 2 3.05	10 to 12 12.42	4 to 5 3.10
{ Claimed..... { Found.....	2 to 3 2.00	10 to 12 9.48	1 to 2 3.65	11 to 14 13.13	1 to 2 1.35
{ Claimed..... { Found.....	----- -----	14 to 15 14.59	1 to 2 3.43	15 to 17 18.02	----- -----
{ Claimed..... { Found.....	1 to 2 1.66	10 to 12 8.73	1 to 2 4.51	11 to 14 13.24	1 to 2 .75
{ Claimed..... { Found.....	1.5 to 2 1.89	9.5 to 11 9.73	2 to 3 1.97	11.5 to 14 11.70	2 to 3 2.19
{ Claimed..... { Found.....	1.28 to 2.25 1.72	8 to 10 9.14	----- 1.73	----- 10.87	1.5 to 2.5 1.55
{ Claimed..... { Found.....	2 to 3 2.16	8 to 10 8.42	----- 1.55	----- 9.97	2 to 3 2.24
{ Claimed..... { Found.....	2.75 to 3.5 2.96	9 to 12 10.19	.5 to 1.5 .73	9.05 to 13.5 10.92	1.75 to 2.5 2.71
{ Claimed..... { Found.....	----- -----	10 to 12 10.63	----- 1.47	----- 12.10	3 to 4 4.73
{ Claimed..... { Found.....	2.35 to 3.25 2.98	8.5 to 10 9.49	----- .81	----- 10.30	5 to 6 5.83
{ Claimed..... { Found.....	3.36 to 3.94 3.15	11 to 13 9.10	----- .46	----- 9.56	2 to 2.5 3.84
{ Claimed..... { Found.....	2 to 3 2.45	8 to 10 8.77	----- 2.19	----- 10.96	----- -----
{ Claimed..... { Found.....	----- -----	30 to 34 33.63	----- 3.33	----- 36.96	----- -----
{ Claimed..... { Found.....	1.5 to 2 2.09	7 to 9 8.20	.5 to 1.5 .35	7.5 to 10.5 8.55	5 to 6 4.99
{ Claimed..... { Found.....	1.5 to 2.5 1.87	8 to 10 7.36	1 to 2 3.32	9 to 12 10.68	2.16 to 3.24 2.25

*Results of analysis of commercial fertilizer*

Manufacturer.	Trade name.	Dealer and locality.
Niagara Fertilizer Co., Buffalo, N. Y.....	Grain and Grass Grower.....	Stafford & Shoemith, Romeo.
Northwestern Fertilizer Co., Chicago, Ill.....	Pure Ground Bone.....	C. B. Waterloo, Port Huron...
Northwestern Fertilizer Co., Chicago, Ill.....	Garden City Superphosphate..	Farmers' Elevator Co., Lenox.
Northwestern Fertilizer Co., Chicago, Ill.....	{ Raw Bone and Superphos- phate Mixture..... }	C. C. Van Doren, Adrian.....
Northwestern Fertilizer Co., Chicago, Ill.....	Acidulated Bone and Potash..	C. B. Waterloo, Port Huron...
Northwestern Fertilizer Co., Chicago, Ill.....	Acidulated Bone.....	C. B. Waterloo, Port Huron...
Northwestern Fertilizer Co., Chicago, Ill.....	Potato Grower.....	C. C. Van Doren, Adrian.....
Northwestern Fertilizer Co., Chicago, Ill.....	Corn and Wheat Grower.....	C. B. Waterloo, Port Huron...
Ohio Farmers' Fertilizer Co., Columbus, Ohio.....	{ Ammoniated Bone with Potash..... }	Schneider & Reindel, Frazer..
Ohio Farmers' Fertilizer Co., Columbus, Ohio.....	{ Corn, Oats and Wheat Fish Guano..... }	Schneider & Reindel, Frazer..
Ohio Farmers' Fertilizer Co., Columbus, Ohio.....	Soluble Bone and Potash.....	Schneider & Reindel, Frazer..
Emery J. Smith & Co., Columbus, Ohio.....	Ammoniated Bone and Potash.	Manufacturer.....
Speldel & Schwartz, G'd Haven, Mich.....	Celery Hustler.....	{ Speldel & Schwartz, Grand Haven..... }
Williams & Clark Fertilizer Co., Cleveland, Ohio.....	Prolific Crop Producer.....	Geo. L. Frank, West Bay City.
Williams & Clark Fertilizer Co., Cleveland, Ohio.....	Dissolved Bone and Potash....	Geo. L. Frank, West Bay City.
Williams & Clark Fertilizer Co., Cleveland, Ohio.....	Royal Bone Phosphate.....	Geo. L. Frank, West Bay City.

for 1899, expressed in parts in a hundred.

	Available nitrogen.  Estimated as ammonia.	Phosphoric acid.			Potash soluble in water, esti- mated as K <sub>2</sub> O.
		Available.	Insoluble.	Total.	
{ Claimed..... { Found.....	1 to 2 1.68	7 to 9 8.31	1 to 2 2.69	8 to 11 11.00	1.08 to 2.16 1.91
{ Claimed..... { Found.....	3 to 4 4.48	4.66	16.49	18 to 22 21.15	
{ Claimed..... { Found.....	2.5 to 3 3.22	8 to 9 8.27	4 to 4.5 3.79	12 to 13.5 12.06	.54 to 1.08 .77
{ Claimed..... { Found.....	3 to 3.5 3.98	7 to 8 8.06	7.59	14 to 16 15.65	.54 to 1.08 .86
{ Claimed..... { Found.....	1 to 2 1.10	10 to 12 10.04	2 to 3 4.17	12 to 15 14.21	1.5 to 2 1.27
{ Claimed..... { Found.....	1 to 2 1.25	10 to 12 10.10	2 to 3 2.85	12 to 15 12.95	
{ Claimed..... { Found.....	3 to 4 3.15	8 to 10 8.97	2 to 3 1.96	10 to 13 10.93	2 to 2.5 1.69
{ Claimed..... { Found.....	2.5 to 3 2.52	10 to 12 10.03	2 to 3 3.70	12 to 15 13.73	1 to 1.5 .88
{ Claimed..... { Found.....	1 to 2 1.72	8 to 10 6.85	1 to 2 1.33	9 to 12 8.18	4 to 6 4.21
{ Claimed..... { Found.....	1.5 to 2.5 1.42	9 to 11 12.07	1 to 2 2.23	10 to 13 14.30	2 to 4 1.69
{ Claimed..... { Found.....		12 to 14 12.15	1 to 2 1.46	13 to 16 13.61	1 to 2 1.74
{ Claimed..... { Found.....	1 to 2 1.72	8 to 10 8.91	1 to 2 12.08	9 to 12 20.99	1 to 2 4.48
{ Claimed..... { Found.....	8.15 to 9.68 8.02	2.43	1.41	3.17 to 3.40 3.84	1.25 to 2.5 1.36
{ Claimed..... { Found.....	1 to 2 1.45	5 to 6 8.63	1 to 2 2.61	6 to 8 11.24	1 to 2 1.32
{ Claimed..... { Found.....		9 to 11 10.17	1 to 2 2.50	10 to 13 12.67	2 to 3 1.74
{ Claimed..... { Found.....	1.25 to 2 1.57	6 to 7 8.90	1 to 2 3.43	7 to 9 12.33	2 to 3 2.02



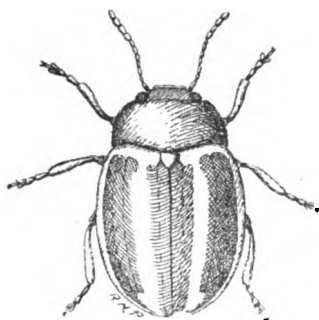
**BULLETIN 175**

**JULY, 1899**

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**EXPERIMENT STATION**

**ENTOMOLOGICAL DEPARTMENT**



**SOME INSECTS OF THE YEAR 1898**

Prepared under the direction of  
**WALTER B. BARROWS**  
Consulting Zoologist of the Experiment Station

**BY RUFUS H. PETTIT**  
Assistant Entomologist

**AGRICULTURAL COLLEGE, MICHIGAN**  
**1899**





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The Bulletins of this Station are sent free to all newspapers in the State and to such individuals interested in farming as may request them. Address all applications to the Secretary, Agricultural College, Michigan.

## MICHIGAN AGRICULTURAL EXPERIMENT STATION

Postoffice and Telegraph Address, . . . . . Agricultural College, Mich.  
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A DEPARTMENT OF THE STATE AGRICULTURAL COLLEGE, AND, WITH IT, CONTROLLED BY THE

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### SUB-STATIONS

Grayling, Crawford County, 80 acres deeded.  
 South Haven, Van Buren County, 10 acres rented; 5 acres deeded.

## INTRODUCTORY.

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The insects treated in this bulletin are only a small fraction of those which have come under our notice during the year of 1898, and it should be stated further that this report relates only to the summer of that year.

Notes are given on about twenty species of insects, a list of which will be found on the following page. Bulletin No. 160, published in June of last year, covered twenty-eight species, all different from those here given. A subsequent bulletin probably will take up some other insects which have been troublesome, and thus it is hoped to cover by degrees all the more destructive or otherwise interesting insects of the State.

It may be well to repeat here the advice given to correspondents last year, which is as follows:

Whenever information is wanted in regard to any insect, insect work, or insecticide, the proper person at the College to address is not anyone whom you may know personally, or by name or reputation, but simply "The Entomologist of the Experiment Station," Agricultural College, Mich. Inquiries addressed in this way are sure to reach this department directly and to receive attention at the earliest possible moment. If addressed otherwise, delay may occur for various reasons, and in some cases the loss of a single day might endanger an entire crop.

It is well to remember that the most careful description of an insect is seldom as good as the insect itself, while in most cases a mere fragment of the actual insect is better than a page or two of description. Therefore in writing for information about any insect always enclose a specimen if possible, no matter how common or well known you may believe it to be; and if no sample of the insect can be found, send a sample of its work. In sending specimens by mail, they should be sent in glass or tin if possible, and with some of their natural food if alive. Leaves and fruits wilt rapidly if enclosed in wood or pasteboard boxes, and are also very likely to be crushed or broken in transmission. Small tin boxes of any shape may be used, and it is well to put a slip of paper with the address of the sender inside the box, in case the outer wrapper should be torn off or defaced. If a letter is enclosed with the specimens, the whole package is subject to letter postage; if the two are sent separately, they should be addressed exactly alike, and the package of specimens should be marked with the sender's name and address *invariably*. Failure to attend to this simple rule has led to more disappointment and trouble than would be supposed. Rarely does a week pass when we do not re-

ceive specimens without letters, or letters without specimens which are said to have been sent; and it is no uncommon thing during the height of the season to receive half a dozen packages by the same mail and to be unable to decide which are the insects referred to in letters received at the same time. Always send insects alive if possible, but send in strong, tight boxes—insects need no air-holes whatever. Never try to kill scale insects or others by dipping in kerosene or other insecticide before mailing. Always state definitely what harm, if any, the insect is supposed to be doing, and whether it is abundant or scarce.

Sixteen of the twenty illustrations for this bulletin were prepared expressly for it by Mr. R. H. Pettit, the Assistant Entomologist of the Station, and their accuracy and beauty leave little to be desired. The remaining cuts have been taken from trustworthy sources and proper credit given. The bulk of the text has been written by Mr. Pettit, and it is believed that the whole forms a valuable addition to our knowledge of the insects of the State.

We should be glad to receive further notes on any of the species mentioned, and particularly personal experiences with any of the injurious forms and their supposed remedies.

WALTER B. BARROWS,  
Consulting Zoölogist.

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## 1. AMERICAN LOCUST.

*(Schistocerca americana.)*

One of the most beautiful of our locusts or grasshoppers is the American Locust. This insect, while it is a serious pest in the central and southern states, has been reported, probably for the first time, in Michigan during the past summer. Specimens were sent here from three widely different parts of the State—Springville, Lenawee county; Frankfort, Benzie county, and Berrien Springs, Berrien county. They were not said to be injurious in these places and only occasionally seen.

While this insect has never been known to be injurious as far north as this, its large size makes it a formidable enemy when it comes in large swarms, as it does farther south. In places where it abounds it is fought in the same way as we fight our grasshoppers—with poisoned baits, hopperdozers, etc.

## 2. ONION THRIPS.

*(Thrips tabaci Lindeman.)*

Toward the latter part of September complaints were made that a louse or some minute insect was attacking onion tops in the vicinity of Chelsea, Michigan. Specimens of such onion tops were found to be infested by a species of thrips (*Thrips tabaci*), the great majority of the insects being in the wingless or immature stage. They are very small,

green, inconspicuous creatures and seem to prefer the auxillary region where two leaves approach each other: The effect of their depredations is noticeable at some distance. The tops become stunted and sickly turning whitish wherever the insects congregate. The leaves sometimes decay if the weather is wet, and the keeping quality of the onions is said to be impaired by the work of these pests.

On examining some of the plants on the College farm, they were found to be infested.

The immature insects, which are far more plentiful than the adult, are about 1-24 of an inch in length and yellowish green in color. They are so small as to be almost imperceptible to the unaided eye, but a careful examination reveals them in close proximity to the white spots on the onion tops. They appear, when greatly magnified, somewhat as represented by Fig. 1. The body is long and tapering, with six legs near the anterior end; the antennae or feelers are six-jointed, and the feet are like



Fig. 1. Onion Thrips, *Thrips tabaci*, immature.  
(Original.)

those of all true thrips, destitute of claws.

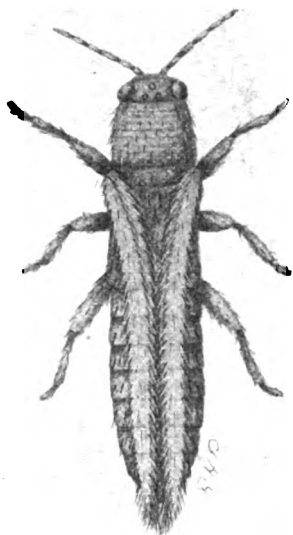


Fig. 2. Onion Thrips, *Thrips tabaci*, mature.  
(Original.)

The adult winged insect is represented by Fig. 2, shown at rest, with the wings closed, as this is the position in which it is most often seen. The general color is dirty yellow with dusky markings. The feelers are seven jointed, and the size slightly larger than the immature stage. The extremely narrow wings are fringed with long hairs on each side, giving them a feathery appearance.

#### NATURAL ENEMIES.

*Gregarinida*. There are several insects that feed on the tobacco thrips, reducing its ravages, also a parasite, not an insect, that will probably prove to be a gregarinid, was found in many of the dead bodies of this pest. It was noticed that in the breeding-cages, which were rather moist, many of the insects were dying and turning black; on examining one of them in water under a high power of the microscope it was found to be

packed completely full of small spherical bodies (Fig. 3.) These little



Fig. 3. Gregarinida in Onion Thrips. (Original.)

bodies, 16 to 20 microns or one twelve hundred and fiftieth of an inch in size, had entirely exhausted the body contents of the insects, leaving nothing else in them; they were dark purplish black in color with eccentric nuclei. One of these spheres, on being crushed, let out about a dozen smaller elongated bodies that answered very well to the description of pseudonavicelli, which are usually contained in the spores of gregarinids.

The disease caused by these parasites seemed to thrive best in moist atmosphere, as in the cages. Owing to the lateness of the season, it was not possible to observe the transformations of this interesting organism and thereby to place it accurately.

In a bulletin of recent date by Prof. Quaintance of the Florida Experiment Station, the life-history of the insect is described. According to this bulletin, the average length of time required for the adult to be developed from the egg is sixteen days, thus allowing many generations to mature in a single season. However, it is quite probable that in Michigan the time required is somewhat longer because of the colder climate. In Russia, where the insect first appeared on tobacco, there are said to be three generations during the year.

A description of this insect and of its work, as well as a résumé of the recent literature on the subject, is given by Mr. Thomas Pergande of the United States Department of Agriculture at Washington.\*

In this account a large number of plants are said to be attacked; among others cabbage, cauliflower, squash, turnip, catnip, sweet-clover, and cultivated flowers. It is a serious tobacco pest in Russia.

#### REMEDIES.

Thrips in general are classed with the sucking insects, and to kill them we must resort to contact insecticides. Kerosene-emulsion, used at the rate of one part of the emulsion (Hubbard formula) to ten of water, has been found to destroy them. Drenchings of cold water are said to be useful on a small scale, for all the members of this family thrive best in a dry atmosphere and soon succumb to continued moisture. Whale-oil soap, used at the rate of one pound to four gallons of water, will no doubt prove a very good remedy.

### 3. THE RING-LEGGED TREE BUG.

(*Brochymena annulata* Fab.)

Mr. John E. Hoag, of Cannonsburgh, Kent county, Michigan, reports the finding of numbers of these interesting bugs (Fig. 4) in his peach and plum orchard, and while no complaint of serious injury is made, the occurrence is of interest because injury has been done by this insect in other states. It has been reported two or three times as working on apple trees, but never before in Michigan, so far as is known to the writer. The insect is noticed here not because it is considered dangerous, but in order to prevent anxiety if it should appear from time to time. It will no doubt readily succumb to kerosene-emulsion or whale-oil soap in the usual proportions.

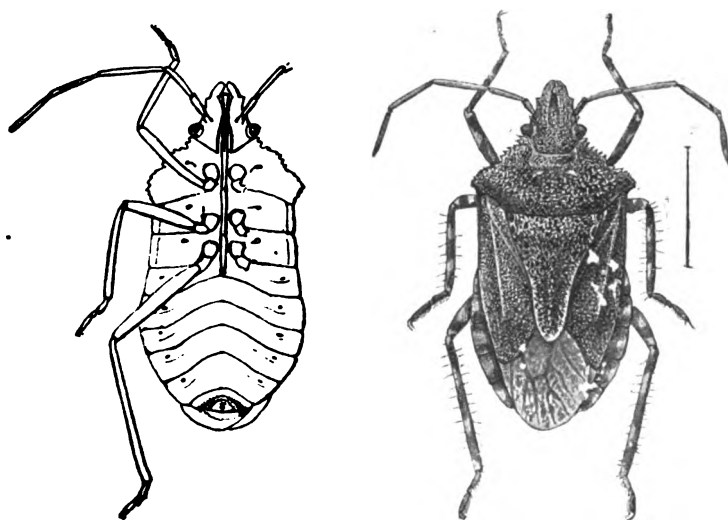


Fig. 4. Ring-legged Tree Bug, *Brochymena annulata*. After Riley and Howard, Insect Life. Division of Entomology, U. S. Department of Agriculture.

\* Insect Life Vol. vii, pp. 392-5.



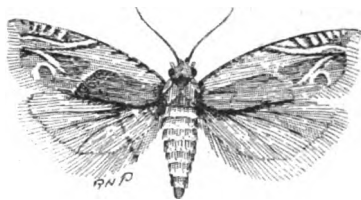


Fig. 5. Strawberry Leaf-roller, *Phoxopteris complana*. (Original.)

#### 4. THE STRAWBERRY LEAF-ROLLER.

(*Phoxopteris complana*.)

One of the most troublesome insects of the season of 1898 was the strawberry leaf-roller (*Phoxopteris complana*).<sup>\*</sup> From all over the southern part of the State, wherever strawberries were grown, came complaints. Specimens of the curled leaves were sent us from Three Rivers and the adult moth was bred from them. The caterpillars are small yellowish or green "worms," which feed on the leaves and cause them to curl up tightly into little clumps which are then bound together with a silken web. Often the enclosed spaces are partially lined with the same material, making a nest. The caterpillars or larvae may be found usually by pulling apart some of the curled leaves. They vary in color from pale yellowish to quite a decided green, and when full grown are about one-third of an inch in length, slender, and gently tapering. The adult winged form, not seen so often, is a very small and delicate moth, reddish brown and dusky in color, with black and white markings and about one-fourth of an inch in length, while the extended wings measure a little less than half an inch.

This dainty little moth comes forth early in the spring and lays its eggs for the first brood on the young strawberry leaves. These eggs hatch and the "worms" or caterpillars appear in June. If numerous, they devastate the strawberry beds and then, becoming adults lay more eggs in September. These eggs hatch and the young "worms" have just about time enough to become full-grown and go into the ground for the winter.

#### REMEDIES.

After the first year of course no poison should be used on the plants before the berries are gathered, but directly after gathering the berries, or during the first year before the plants bear, the plants should be cut off close with a mowing machine and burned. The field may then be sprayed with Paris-green and lime, which will serve to kill numbers of the full-grown worms in the leaves and also to poison what young larvae may come from the eggs already laid. The spray, of course, should be repeated as long as any caterpillars remain. This method should prove of great benefit and the regular rotation of crops will also be found useful. In some instances the fields have been burned over, with good

<sup>\*</sup>The hymenopterous parasite *Temelucha cooki* and *perilampus cyaneus* were bred from this moth. They were determined by Mr. Wm. Ashmead of the Department of Agriculture Washington, D. C., through the kindness of Dr. L. O. Howard.

results, instead of cutting with a machine. This was done about the time that the second brood of worms appeared.

The worms are easily killed with a spray of Paris-green and lime, but as this must not be used before the fruit is harvested, some other remedy is often required, and this is found in kerosene-emulsion. Obviously this must not be sprayed on ripening fruit, but the spray must be applied in time to allow the oil to evaporate before the fruit is picked. If this is done as soon as the worms appear and repeated until just before picking time it will prove a comparatively easy task to keep the worms in check. It must be remembered, however, that kerosene-emulsion requires much more careful application than the arsenites, for each worm must be hit to be killed. After the crop is harvested the plants should be mowed and treated with Paris-green as previously advised to guard against the appearance of the pest next season.

### 5. A NEW PEACH-WORM.

*Depressaria persicaella* Murt. sp. nov.

A number of worms working in peach leaves were received from Mr. T. D. Atkinson of Holland, Michigan, on September 17 (Fig. 6). They

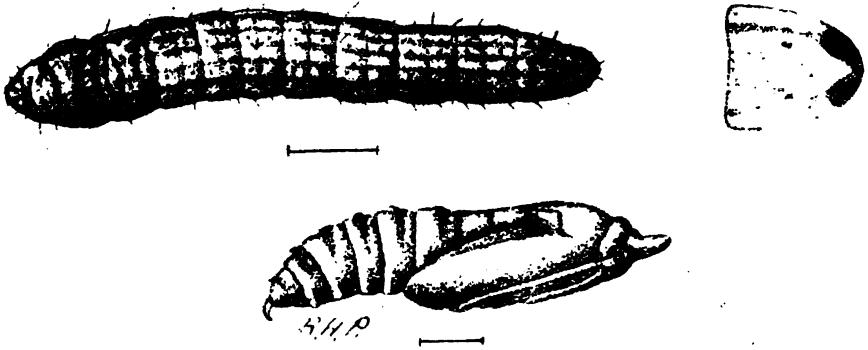


Fig. 6. Peach Leaf-binder, *Depressaria persicaella* Murt. (Original.)

were lepidopterous larvae and were said to be very troublesome. The same species was received on July 3, 1899, from Monroe, Michigan. One or two complaints were made from other places though no specimens were sent.

The larvae are very restive, wriggling violently when disturbed. They bind together the leaves of the peach with fine white silk, forming nests of loosely bound leaves in which they live and where they change

to pupae. The finding of the larvae on July 3rd, and also on Sept. 17th, would seem a good indication that the insect is two-brooded.

Specimens of the larvae from Holland were placed in suitable cages and the moth, a small, nearly black insect, spreading about five-eighths of an inch, was obtained the following spring. The adults commenced to appear about April 14th, and continued to emerge till the middle of May. Of course this is much earlier than would happen if the insects were out of doors.

Specimens were sent to Miss Mary E. Murtfeldt, of Kirkwood, Mo., who has kindly drawn up the following description of the adult insect:

*Depressaria persicivella*. Murt. sp. nov.

"Antennae dark fuscous, indistinctly pectinate and annulate on the under side with pale buff. Palpi long, exceeding the vertex, basal joint short, pale; second joint one-third longer than apical; brush quite dense. dark fuscous overlaid with buff or cream colored scales palest on inner surface; apical joint dark, very slender with extreme tip cream white. most distinctly so in the male. Tongue long, sparsely scaled. Vertex dark brown, face cream white.

Thorax and tegulae purplish brown.

Forewings almost black with rich purplish gloss sparsely sprinkled with white scales. On the costa back of the apex is a small irregularly triangular cream white spot and a few scattered scales of the same color form an obscure outer border. In the cell near the upper margin are two somewhat indefinite, cream-colored dots in line with a third below and slightly back of the one nearest the base. Cilia concolorous with the general surface, shading outwardly to gray. Lower wings shining, silky cinereous almost silvery. Alar expanse from 16 to 17 millimeters. Abdomen pale brown, terminal segment banded with buff at posterior edge: lateral tufts buff and conspicuous; under surface speckled with brown and cream; anal tuft pale reddish brown.

Legs brown, annulate with cream white at the joints and middle of tibiae."

The following description of the larva was written by the author from the living insect:

*Description of Larva.*—The larva, when full grown, is three-eighths of an inch in length and quite slender. Its color is dirty yellowish-white with back and sides marked by six reddish-brown longitudinal stripes all of which extend the entire length from the thoracic shield to the caudal extremity except the pair on the dorsum which unite on the last segment and terminate there. Last segment bordered caudally with fuscous and base of anal pro-legs colored the same. Venter marked along the middle with a stripe like those on dorsum and sides, which are about equidistant from each other and of about the same width as the spaces between them, color reddish-brown. Some of the spaces (yellowish-white) have dark points in them. Head and thoracic shield yellowish-brown, feet fuscous and dirty yellow. Four pairs of pro-legs beside anal pair which are of the same color as the ground color of the body. Base of anal pair black.

## REMEDIES.

The two methods which probably will prove of most use in fighting this trouble are cutting out, and spraying with Paris-green. The nests become quite conspicuous and in many instances can be cut out and burned without doing too much harm to the tree. A spray of Paris-green will kill the worms if applied so as to penetrate the nests. Of course lime must be used with the poison, and neither peach trees nor any other fruit trees should be sprayed with Paris-green after the fruit becomes of any size.

## 6. FOREST TENT-CATERPILLAR.

(*Clisiocampa disstria* Hub.)

An insect very similar to our orchard tent-caterpillar, but differing somewhat in appearance and habits, is the tent-caterpillar of the forest. An outbreak of this insect was the cause of some damage in Kalkaska and Antrim counties in the early summer of 1898. A belt of land about 30 miles long and nearly as broad, extending across both counties, was infested, the caterpillars appearing in such numbers as actually to stop trains. We are indebted to Mr. Skeels, then Assistant Secretary of the College, for specimens of the insects as well as the data for this particular infestation.

The eggs of this insect (Fig 7, d) are laid in masses around the twig or branch of a tree and pass the winter in this form. Early in the spring, about the time the leaves open, or a little before, the eggs hatch and the little caterpillars commence to spin a web, as in the case of the ordinary orchard tent-caterpillar. They enclose the young foliage in a net and a whole family, all that hatch from a single egg-mass, live here together when they are not feeding, at least until the caterpillars attain quite a size. The caterpillars become full grown about the middle of June or the first of July, at which time they come down from the trees and look for suitable places in which to spin their cocoons. It is while searching for such places that they become most noticeable, often traveling along a fence in such great numbers as almost to hide the fence. They gather in great numbers on railroad tracks and, as in the instance mentioned, sometimes impede travel. Their bodies on being crushed make the rails so slippery that the trains come to a standstill when the grade is at all unfavorable.

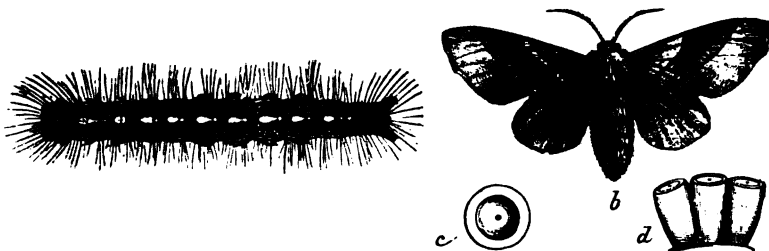


Fig. 7. Forest Tent-Caterpillar, *Clisiocampa disstria*. After Riley. Report on Insects of Missouri (Thrd).

**Description of Larva.**—The full-grown caterpillar (Fig. 7) is about 1½ inches long with a ground color of pale blue, sprinkled with black points

and dots. Along the middle of the back is a row of about ten lozenge shaped white spots and behind each of these spots is a smaller dot of the same color. The entire caterpillar is sparsely covered with soft hairs.

After finding a suitable place, the caterpillar spins up in a loose but strong cocoon, with the silk of which is usually mixed a good deal of yellow powder. The specimens sent to us emerged on July 14 as winged moths (Fig. 7 b); they are dull yellowish or reddish brown in color and when the wings are spread out the female measures about one and three-fourths inches across, the male being a little smaller. Across the front wings extend two oblique dark stripes. After pairing the eggs are laid and remain for about nine months before hatching. The number of trees attacked by this insect is very large, the list including the oak, walnut, ash, bass-wood, rose, hickory, apple, peach, willow, maple, poplar, plum, cherry, thornapple, beech, and several others. With so large a list of available food-plants the caterpillars can not easily be starved out. Luckily they are seldom numerous two years in succession, as their parasites usually keep them in subjection.

#### REMEDIES.

Of course in the forest, spraying would seldom be resorted to, both because of the difficulty of reaching the tree tops and because of the expense. It often happens, however, that the caterpillars work in shade-trees, and here they can readily be killed by a spray of Paris-green, using one pound of the poison to about 150 gallons of water, and adding one pound of fresh quick-lime to the mixture. Do not spray without the lime, for the mixture recommended would do serious injury to many trees if the lime were omitted.

### 7. THE SADDLE-BACK CATERPILLAR.

(*Empretia stimulea* Clem.)

. From time to time insects are carried far from their natural home and colonies are started which may or may not survive the change, depending on the amount of climatic differences between the two places and on the hardness of the insects. Two species of insects, transported in this way, have been found in Michigan during the past season, one of which so far as is known to the writer, has not been reported heretofore. One is the saddle-back caterpillar, *Empretia stimulea* Clem., and the other the American Locust, *Schistocerca americana*. Both are very destructive insects in their native states. Whether they will remain with us and become serious pests, or die out owing to our more severe winters, or stay with us, but not become numerous enough to be injurious, are questions that it is impossible to answer at present. It would seem, however, that as they are both natives of America, they would have been here before if the climatic conditions were at all favorable to them, the more so as they are found directly south of us in southern Indiana and Ohio.

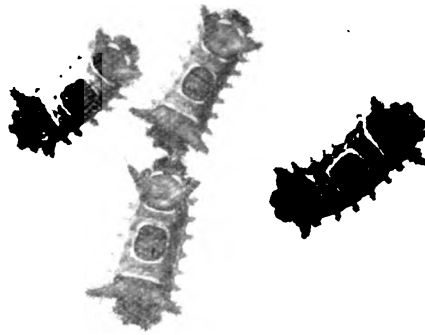


Fig. 8. Saddle-back Caterpillar, *Empretia stimulea*. (Original.)

Fig. 8 represents the larva of the saddle-back caterpillar about natural size. It is apparently footless, progressing like a slug by the undulations of the soft shiny skin of the under surface. The six jointed legs are present, but the soft fleshy pro-legs, that caterpillars usually have, are absent. In general color it is chocolate brown, having a bright apple-green spot, shaped like a saddle-cloth, on the back. The saddle is represented by a brown oval spot in the center of the green. The four fleshy knobs or conical projections are covered with sharp hairs that easily break off when handled and which convey a poison that acts very much like that of the nettle, producing a sharp stinging or burning pain. The stings from this slug have been known to produce serious results with people of delicate constitution.

The specimens sent us were from Mr. A. Sigler, Adrian, Mich., and they were on pear. The species also works on cherry and probably on some other fruit-trees, on oak and some other forest-trees, and on rose, grape, corn, *Helianthus*, currant, sumach and raspberry.

It has been found in the State several times before, once in Lansing by Mr. Victor Lowe of the Geneva Experiment Station, but its occurrence in Michigan is rare.

#### REMEDIES.

This slug is easily destroyed by the arsenites, Paris-green, etc., whenever it becomes necessary. When stung by the hairs, relief can be obtained by bathing the affected part with soda (bicarb.) or with a weak wash of ammonia.

### 8. THE RESPLENDENT SHIELD-BEARER.

(*Aspidisca splendoriferella* Clem.) \*

At the time when the leaves are just about to fall, during the last of September and first of October, the leaves of the wild cherry, *Prunus*

\* This species was determined by Miss Mary E. Murtfeldt of Kirkwood, Mo.

*serotina*, are sometimes seen to be perforated with regular rows of holes about one-fourth of an inch long. Sometimes as many as a dozen holes are ranged along both sides of the mid-rib of a single leaf. Several trees on and near the College campus, were seen to be badly pierced in this way, early in the autumn of 1897. A short time afterward, numbers of little pieces of leaf, corresponding in form to the holes in the cherry leaves, were found attached by fine silken cords to the leaves and branches of a spruce tree standing near, and some were found also on the trunk of the cherry tree itself. These little pieces of leaf were all hollowed out between the upper and lower skins or epidermises and in the hollows thus made were tiny grubs, each piece of leaf constituting the home of a single grub. A number of the little cases were placed in suitable breeding-cages and in the early spring the little moths commenced to emerge, continuing until the middle of May, at which time they probably emerge out of doors. The insect in its different stages is shown in Fig. 9.

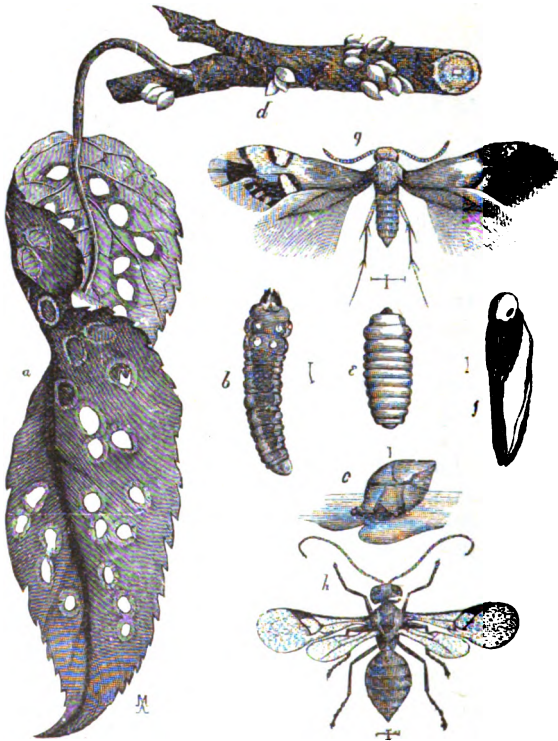


Fig. 9. Resplendent Shield bearer, *Aspidisca splendoriferella*. After Comstock, Report of Entomologist for 1879, Division of Entomology, U. S. Department of Agriculture.

On September 1, 1898, the same insect was observed to be working on the same tree, part of the cases already cut out, while in other instances the insects were still in the mines getting ready to cut around themselves and thus transform the mines into cases. It is a fact worthy of note that while many of the leaves of the cherry remained on the tree at the

time when the larvae were tying their cases up for winter, no cases were fastened to the cherry leaves, but almost all of them to the evergreen trees near by, or to the twigs and bark of the cherry tree itself, instinct thus guarding against the use of destructible supports.

While a healthy tree can easily withstand the attack of a few insects of this sort, the effect becomes more serious as their numbers increase, though if the insect would confine its attentions to wild cherries no great harm might result. Unfortunately this case-bearer works also on apple and thorn-apple as well as occasionally on pear, and its work is sometimes very serious. Luckily it is fairly conspicuous and easily recognized.

#### REMEDIES.

When the insect attacks fruit trees it can be kept in comparative subjection by the use of winter washes. Prof. Comstock recommends\* a winter wash of lime and sulphur, using one-half bushel of shell lime to six pounds of powdered sulphur, and the mixture brought to the consistency of whitewash with hot water. This should be applied to all parts that can be reached. It is probable that other winter washes in common use against scale-insects also will prove beneficial here.

### 9. SOME INSECTS OF OUR SHADE TREES.

It is often of as much advantage to know which insects are harmless as to know which are injurious. Many insects are harmless for long periods of time and then, some season when the conditions are right, they multiply to a surprising extent and become, for a short time, serious pests, only to subside again quickly to their ordinary number. A large number of insects are conspicuous and attract a great deal of attention while the damage resulting from them is so slight that it is insignificant. Much time and trouble are annually wasted in fighting insects that belong to this latter class. To both of these classes belong many insects working on shade and forest trees.

### 10. LEAF-MINERS AND CASE-BEARERS.

The leaves of shade and forest trees are often disfigured by patches of dead skin in the form of blisters or blotches of various shapes; sometimes irregular in outline, sometimes trumpet-shaped, and in other cases of all conceivable shapes and sizes. If we look more closely into the matter, we find that there is a good deal of regularity in the form and size of these blotches on any one kind of a tree, those found on a particular tree at a certain time, usually being a good deal alike or belonging at most to two or three different sorts. These mines or blisters are the dwellings of small insects that live on the soft succulent tissue found between the upper and lower surfaces or skins of the leaf. Very small indeed must an insect be to find room to live in such a place, but these little fellows do it, and sometimes congregate in such numbers as to seriously affect the trees.

\* Rep. Ent. U. S. Dept. of Agr. 1897, p. 212.



## 11. WHITE OAK LEAF-MINER.

( *Lithocolletis cinnamomea* Clem. ) \*

An oak leaf-miner that multiplied to a surprising extent last summer is shown in Fig. 11, which represents the adult moth. The larva or

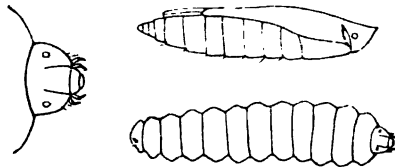


Fig. 10. Oak Leaf-miner, *Lithocolletis cinnamomea*, larva and pupa. (Original.)

grub, an enlarged figure of the head, and the pupal or resting stage, are shown in figure 10.

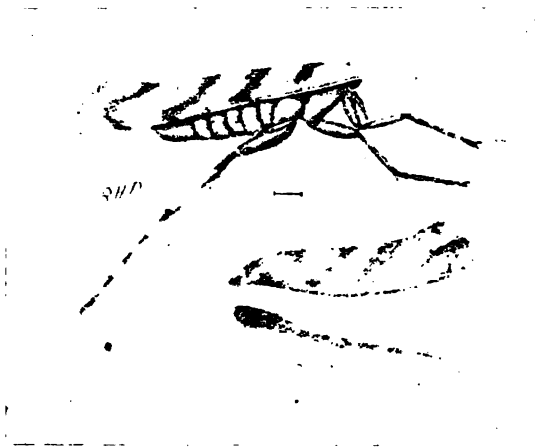


Fig. 11. Oak Leaf-miner, *Lithocolletis cinnamomea*. (Original.)

These dainty and minute moths were the parents of millions of grubs that so persistently attacked the white oaks all over the southern part of the State as to change the general color of the trees from a healthy green to a sickly brownish hue. Some leaves contained only one mine, but many contained two or three, while each mine contained from one to five or six larvae. The effect of thus destroying the breathing apparatus of the tree can not but be injurious. This particular species is two-brooded in Michigan, the summer brood maturing about the middle of July and the spring brood some time in the spring when the foliage has become suitable for egg-laying. The summer brood passes the winter in the pupal or cocoon stage inside the mines in the leaves, each insect spinning a circular flat sheet of silk over itself to ensure its safety. The

\* This insect was kindly determined by Miss Mary E. Murtfeldt of Kirkwood, Mo.

pupae fall, with the leaves, and pass the winter on the ground. If now we rake up the leaves and burn them, we shall destroy great numbers of the insects.

The following hymenopterous parasites were bred from this leaf-miner: *Sympiesis uroplatae*, *Chrysocharis albipes* Ashm., *Pteromalid* sp. *Sympiesis nigrofemora* Ashm., *Eulophus tricladius* Prov., *Orgilus coleophora*, *Protopanteles monticola* Ashm. They were determined by Mr. Wm. Ashmead of the Dept. of Agr. at Washington, D. C., through the kindness of Dr. L. O. Howard.

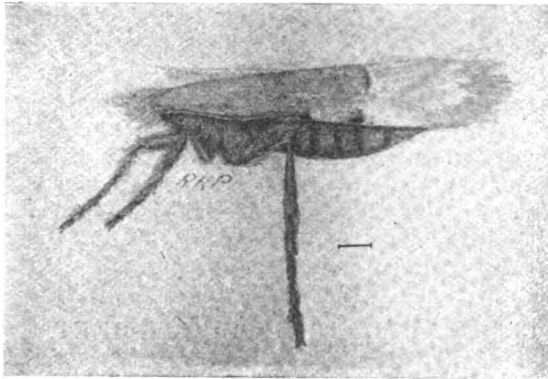


Fig. 12. Basswood Blotch Leaf-miner, *Lithocolletis lucetiella*. (Original)

## 12. THE BASSWOOD LEAF-MINER.

(*Lithocolletis lucetiella*, Clem.)†

Very many of our lindens or basswood trees were attacked by a leaf-miner, *L. lucetiella*, Clem., and though no damage resulted other than the injury to the appearance of the tree, their work was very conspicuous. Fig. 12 represents an adult moth of this species. The moths emerged on July 29.

Two more species were observed in quantity; one on the common locust (*Robinia pseudacacia*) and the other on a smaller variety used for ornamental purposes (*R. hispida*). The name of the insect is *Gracillaria robiniella*, Cham.\* The leaf-miner in the common locust makes a blister mine more regular in shape. Its name is *Lithocolletis robiniella*, Clem.

Fig. 13, represents *Depressaria argillacea*, Wlsm.\* found on linden.

\* These two insects were determined by Miss Murtfeldt of Kirkwood, Mo.

† A hymenopterous parasite, *Clasterosotus tricluctus* Ashm., was bred from this miner. It was determined by Mr. Wm. Ashmead of the Dept. of Agr. at Washington, D. C., through the kindness of Dr. L. O. Howard.

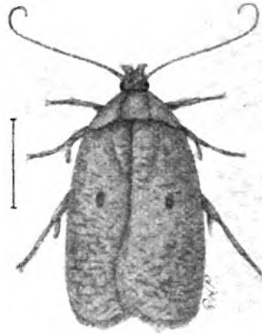


Fig. 13. *Depressaria argillacea* Wlsm. (Original.)

### 13. LEAF-MINER IN SUGAR-BEET.

(*Pegomyia vicina* Lint.)

It was planned, during the season of 1898, to study the insects affecting sugar-beets. Fields were examined wherever opportunity offered, but all the accessible ones proved to be remarkably free from insect attack; some of the leaves, however, were observed to be infested with a leaf-miner which produced a blister-like mine on the upper surface of the leaf by eating out the succulent material between the upper epidermis and the lower. Specimens of such mined leaves were placed in a cage on June 28, and on July 19 the adults (Fig. 14) emerged. They were



Fig. 14. Sugar-beet Leaf-miner, *Pegomyia vicina* Lint. (Original.)

about half the size of a house-fly and approached it somewhat in appearance. On examination, they were found to belong to the family of flies known as Anthomyidae, which family contains many other flies injurious, in the maggot stage, to various vegetables, as the onion-fly, cabbage root-maggot, bean-maggot, etc. The particular species found in the beet leaves was first described, in 1882, by the late Dr. Lintner, State Entomologist of New York, where it was doing considerable damage. The beet leaves were so extensively mined that they could not be used for greens. Indeed, he reports that several cases of sickness were supposed to have been caused by eating greens infested by this insect.

While no serious trouble was experienced with this maggot during the past season, it is quite probable that the increasing acreage of beets in Michigan, brought about by the growing of beets for sugar, will furnish a place for these insects, as well as for others, to thrive.

There are a number of insects that are troublesome in Europe, and it is probably only a matter of time when we shall get some of them. It is to be hoped that any insects found injuring this crop will be immediately forwarded to the Entomologist, in order that, where necessary, investigations and experiments may be made to determine the best means of control. It is quite probable that the sugar-beet leaf-miner is several brooded. When ready to pupate, most of the maggots pass out of their mines in the leaves into the ground, although some may remain in the leaves. The insects were not numerous enough last summer to allow experiments, but it is very probable that the destruction of the tops and the fall plowing and rolling will prove useful, as it will break up many of the puparia and bury them so deeply that the adults can not get out.

## 14. THE HESSIAN FLY.

*(Cecidomyia destructor.)*

FIG 15. Hessian fly, *Cecidomyia destructor*. After Packard, Third Report of Entomological Commission, Division of Entomology, Department of Agriculture.

For two seasons the growers of wheat, especially those in the northern part of the State, have been troubled with the Hessian fly, and as no

detailed account of this insect and its method of work has been published in the Michigan bulletins for many years, a description of the pest may prove of interest.

As long ago as 1779, the Hessian fly was reported as doing injury in New York. It was for some time supposed that the insect was introduced into this country, in straw, by the Hessians employed by the British in our Revolutionary war, hence the name "Hessian fly." This explanation, however, has been shown since to be a questionable one. In 1837 the fly appeared at Paw Paw, Mich., and has been troublesome from time to time in our State ever since.

Usually the first intimation a farmer has that the fly is present is the "lodging" of his wheat. An examination of an injured wheat plant is made and just below the point where the break occurs, usually just above the first, second or third joint, are found one or more little dark brown bodies (Fig. 15, c) about one-eighth of an inch in length. These are the puparia, often called the "flax-seeds," and correspond to the cocoons of many moths or the chrysalids of butterflies.

This brings us to the question of the stages through which insects pass in a lifetime. Most insects pass through four principal stages or what corresponds to them, viz.—the egg, the larva (caterpillar or grub) stage, the chrysalis (cocoon or pupa) stage, and the adult stage. Now the third of these stages, the chrysalis or cocoon, is usually a quiescent one, the insect having little or no power of motion. In some cases it is only during this period that we can effectually combat some particular insects which do injury in some one of the other stages. In the case of the Hessian fly, the eggs are laid, usually on the upper side of the leaf, singly or in small groups of two or three. In about four days they hatch and the minute maggots which come from them work their way down between the sheath of the leaf and the stem, where they commence to feed and to grow, at the expense of the plant. After a time the maggots become full-grown and ready to pass into the pupal or flax-seed stage, when the outer skin becomes hard and rigid, forming a protecting shell, inside of which the insect can become a winged fly. This pupal or flax-seed stage is the one most likely to be first noticed. After a time the shell bursts and out comes a delicate fly of very minute proportions, the female fly ordinarily measuring one-tenth of an inch in length and the male slightly less.

The life cycle is probably passed through twice a year in Michigan, though in some states more time seems to be required and in others less.\* For the winter brood the eggs are laid some time in late August, September, or early October, on fall wheat, usually just coming up. The young grubs go down to about the level of the ground and soon become full-grown, ready to become pupae for the winter. In the spring they come out as adult, winged flies, and in April or May they lay their eggs on the young wheat. The young grubs of the spring brood behave just like those of the fall brood, except that they do not go so low down in the plant, usually working just above the first, second, or third joint. All

\* Dr. Paul Marchal (*Les Cecidomyies des Cereales et leurs Parasites* Ann. de la Soc. Ent. de France, 1897) says they may be six brooded under the most favorable conditions.

the adult flies do not come out at once, but occupy some time in doing so, with the result that the broods are not so distinct as would be expected.

#### NATURAL ENEMIES.

Fortunately this insect is kept in check ordinarily by other insects which prey upon it. These other insects belong to the group of parasitic hymenoptera and are very small. They lay an egg in the body of the maggot or on the pupa, which egg gives forth a still smaller grub that subsists on the living body of its host, after a time passing through a pupal stage and finally becoming an adult winged insect inside the remains of the Hessian fly maggot. At the proper time this winged insect, resembling a minute wasp, comes out and lays more eggs in other flies. These parasites usually keep the Hessian fly under control, but occasionally for some reason, climatic or otherwise, the parasites become reduced in numbers or are unable to devour all the flies, and then our wheat, rye, etc., suffer. If we know what a goodly supply of parasites are present in the fields, it is best to wait for them to destroy the flies and not to resort to measures which would destroy friend as well as foe. The presence of the parasites is best known by the small holes left in the wheat stem through which they emerge from the pupa of the fly. The fly itself, when uninjured by parasites, cracks open the shell of the flax-seed and crawls up between the sheath and stalk, but the parasite bores a round hole right through the sheath opposite the flax-seed. If these round holes are numerous in the fall, it is better to leave the stubble standing and to allow the parasites to destroy the flies, for they will do so far more thoroughly than we can ever hope to. Another way to detect the presence of parasites is to gather some of the infested joints and to enclose them in a fruit jar, over the mouth of which is then tied a piece of muslin. If the parasites are present, they will emerge after a time and appear as minute dark, four-winged insects, usually with metallic colors and moving with a quick, nervous, jerky flight, while the Hessian flies themselves are feeble little fellows with two wings and a weaker flight. This last method is of little use, however, since by it we can not settle the question until too late to do us any good.

#### REMEDIES.

*Burning Stubble.*—Immediately after harvest, if possible, the stubble should be burned to destroy the flax-seeds that are present. Of course, this will destroy whatever parasites are present, and if these are plentiful it should not be done.

*Fall Plowing.*—When it is impossible to burn the stubble, and sometimes even when this has been done, it is found beneficial to plow the field immediately after harvest. If we wait for any length of time the flies will escape and then no amount of plowing will do any good. It is well to try to influence your neighbors to do likewise if they have wheat near yours, for it is very easy to infest one farm from another.

*Late Sowing of Fall Wheat.*—As the flies appear in the fall, during the latter part of August, and keep coming out all through September until early in October, it will easily be seen that if we delay sowing our wheat so that it will not appear above ground until after the first week or so in

October, when the flies have disappeared, we shall escape them. It is usually sufficient to delay sowing until after September 20, but this varies somewhat with the season and latitude.

*Traps.*—When we delay the sowing of the crop until late in the season, as described above, it is always best to sow a strip of early wheat a few yards wide, entirely around the field upon which the flies lay their eggs, as they will readily choose the advanced wheat, to that just appearing, for purposes of egg-laying. This strip must be plowed under either *late* in the fall or *early* in the spring to destroy the young flax-seeds.

*Rotation of crops* is good practice and all volunteer wheat should be destroyed.

## 15. A LEAF-BEETLE FEEDING ON PEACH BUDS.

(*Chrysomela suturalis*.)

In November, 1897, Prof. U. P. Hedrick, then State Inspector of Orchards and Nurseries, gave us some small beetles (*Chrysomela suturalis*) which he had obtained from Mr. Higgins of Otsego, Mich. These beetles were said to injure the buds of peach trees in early spring, and as the habit is probably a new one to the species, it seems to be worthy of notice. According to Mr. Higgins, the beetles attacked the buds in April, before they had commenced to grow perceptibly, and especially those buds of fine varieties that had been "budded" or set in, devouring such buds by wholesale. As the beetle is considered, under ordinary circumstances, to be harmless, and known to feed only upon herbage, weeds, etc., of no value, its appearance was awaited with a good deal of interest last spring. Mr. Higgins kindly offered to notify us as soon as the beetles appeared, but fortunately they did not come.

The beetle in question is a small dark brown and white fellow about three-tenths of an inch long and having longitudinal stripes, as shown in the figure. (Fig. 16.) It is to be found at almost any time during a

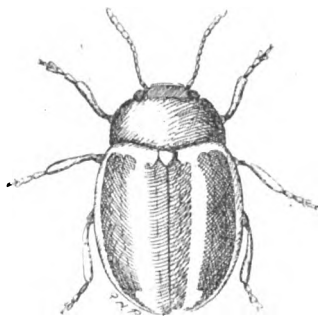


Fig. 16. *Chrysomela suturalis*. (Original.)

thaw in the winter, passing the winter in an adult condition ready to commence work early in spring. It is to be hoped that this habit of eating peach buds is an acquired one brought about by the scarcity of more appropriate food, and that in future years the ordinary food of the beetle will be present in sufficient quantity so that it will not be driven



to attack our peach buds. If however, it appears again, a spray of one of the arsenites will at once kill it.

## 16. THE ELM-BORING SNOOT-BEETLE.

(*Magdalis armicollis* Say.)

A small brown or blackish beetle about five-sixteenths of an inch long with the head prolonged into a long snout. (Fig. 17.) An examina-



Fig. 17. Elm-boring Snout-beetle, *Magdalis armicollis*. (Original.)

tion with a lens shows the entire abdomen and thorax to be covered with small rounded pustules somewhat resembling shagreen.\*

Specimens of this snout-beetle were sent us from Woodland, Barry county, on June 1, 1898. They were said to be very numerous on plum trees and were the cause of some anxiety. In replying to the letter it was explained that this insect was in habit a wood-borer and that most of the members of the genus work in oak, hickory or elm, at least so far as our species go. A careful examination was advised to see if the beetles were really doing any harm, as well as a search for dead or dying trees of the sorts indicated. On June 4 a reply was received, in which was the following statement: "Said trees (plum) are within about twenty feet of our wood-house, which is filled largely with elm limb wood, but none of the trees (elm, hickory or oak) are within twenty rods." The probable explanation is very apparent—the beetles, which burrow just under the bark of the dead and dying elm limbs, had been carried in great numbers in the limbs to the wood-shed and had remained there until their transformations were completed and the time arrived for them to come forth as mature beetles. On attaining maturity, they came out in great numbers and finding the plum trees in the near vicinity, settled on them so thickly as to attract attention. Some idea of the great numbers present in the elm limbs can be obtained from this experience. The elm-boring

\* The specimens of this beetle received differ somewhat in color from the typical form, being almost entirely black. Specimens that were bred by the writer some years since, however, show great variation in size and color, some being quite black, and there is little doubt that the specimens obtained belong to the species *armicollis*.

snout-beetle seems to prefer dead or dying trees, or at least unhealthy ones for its home. Advantage may be taken of this fact in fighting the pest. All dead or dying limbs or entire trees should be removed and burned by the first or middle of May; all branches and loose pieces of wood on the ground should receive the same treatment. By this practice we should receive a double benefit in woodland and forest if such treatment were practicable here, for at the same time that the insects were destroyed, we should remove one of the most efficient means of spreading fires.

In cases where valuable shade trees are involved, it may pay to use trap poles. These are simply poles of green elm set in the ground near the trees to be protected, at a time when the beetles are depositing their eggs. Now the poles being cut, and therefore containing less sap, seem like unhealthy wood to the beetles, which prefer them to the more vigorous trees. The poles should be set during the last part of May and removed and burned some time in July, after making a careful examination to see if the young grubs are present. This method has been successfully employed in Germany in the case of another beetle having somewhat similar habits and will prove useful in cases where the affected trees are valuable. Although these methods will not altogether exterminate the beetles, they should greatly reduce their numbers, so that the harm done will be comparatively slight.

While these insects prefer unhealthy wood to that which is healthy, they do not seem to know just where to draw the line, and their tunneling will sometimes cause the loss of an entire limb or even an entire tree, when but for them the loss might have been confined to one or two comparatively small branches. It is quite likely that they do occasionally attack healthy wood; at least it is thought that they greatly hasten the decay of healthy trees.

## 17. THE FRUIT BARK-BEETLE.

(*Scolytus rugulosus*.)

In 1878, Dr. LeConte noticed a small beetle working in the bark of fruit trees in this country.\* Since that time the beetle has gradually spread over a considerable portion of the United States. Its first appearance in Michigan was in the season of 1897, but as only a single specimen of the work was obtained, with none of the beetles themselves, it was thought best to wait until more material was obtained before publishing an account of the pest, in order to guard against adding another care to the many troubles of fruit-raisers without sufficient reason.

The first intimation of the trouble is in the discovery of numbers of small drops of gum exuding from punctures in the body or limbs of peach, plum, cherry, or apple trees. A closer examination reveals a small round hole a little less than one-sixteenth of an inch in diameter under each drop of gum. If now the outer bark around the hole be removed or pared away, a small burrow will be found to extend for a longer or shorter distance in the layer between the wood and the bark, sometimes branching

\* Am. Phil. Soc. (Proc.) Vol. XVII (1878) p. 626.

considerably. These burrows or galleries usually exhibit a regular and definite arrangement (Fig. 18) when carefully examined; there is an egg



Fig. 18. Wood eaten by *Scolytus rugulosus*. (Original.)

or brood-chamber, short and roomy, and from the sides of this chamber extend, in a direction more or less transverse to it, many slender galleries, small and narrow at the center but gradually increasing in diameter until they attain full size at the periphery. The eggs are laid along the sides of the brood-chamber and the young grubs, on hatching, commence boring in the direction indicated, the regular increase in size being due to the growth of the grubs as they get further and further away from the parental burrow. When the grubs have attained their full size, they go a little deeper and pupate, coming out, in time, through holes bored to the surface, as adult, winged beetles.

In time, the effect on the tree of numbers of these borers is very marked, usually leading to its death.

The beetle (Fig. 19) that causes all this trouble looks innocent enough.

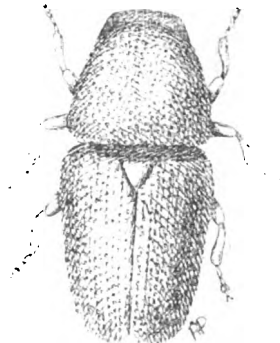


Fig. 19. Fruit Bark-Beetle. *Scolytus rugulosus*. (Original.)

little more than one-sixteenth of an inch in length, almost black, somewhat cylindrical, and covered with minute punctures or pits. It belongs

to the family of bark-borers or scolytidae. The insignificant size of these little fellows almost makes them appear unworthy of notice, but we have most of us learned by this time that the very small pests are the most difficult to control, because they are usually present in such great numbers.

## REMEDIES.

Most members of this family of insects greatly prefer to work in trees that are dying or that for some reason are not in a very vigorous condition at the time; hence when this insect is present it is imperative to keep trees especially well fertilized and in prime condition. When a tree is badly attacked, the cheapest course is usually to remove and burn it, as it merely serves to breed the pests and to furnish a source of infestation for the rest of the trees. Advantage may be taken of the preference of the beetles for sickly or dying trees, and if any worthless or comparatively poor trees are in the orchard, they may be girdled in midsummer in order to induce the beetles to take possession. This will serve as a trap to entice numbers of the beetles to the same spot. Of course the tree will have to be cut down and burned before the beetles emerge, which is said to take place in other states about the middle of June. The insect matures several broods during the course of a season.

When a tree is slightly attacked, the bark may be pared out where the tunnels occur, or the tree may be coated with whitewash to which a little Paris green has been added; this will tend to prevent any further infestation, and if the practice is persistently followed up it is said to be very useful as a preventive. The wash should be applied to all the trunks and limbs in the orchard.

Prof. John B. Smith, Entomologist of the New Jersey State Experiment Station, has carried on a number of successful experiments with hydraulic cement and milk for the peach-borer and it may be possible to use it against the fruit-bark beetle. The cement when used with milk makes a thin hard shell around the parts treated, which prevents the laying of the eggs. While it is not perfectly safe to recommend this remedy for the bark-beetle without careful trial, it is very probable that its use will be attended with considerable benefit.

## 18. THE STRAWBERRY SAW-FLY.

(*Harpiphorus maculatus* Nort.)

An old offender is the strawberry saw-fly. As early at least as 1868 this insect was reported in Michigan, Illinois, and Iowa. This year they were reported from Bridgman, Stevensville and many places near. Specimens were obtained for us from Stevensville by Mr. David W. Trine, "State Inspector of Orchards and Nurseries."

The "worm" or false-caterpillar that does the damage, is a dirty yellow or greenish, naked caterpillar not quite three-fourths of an inch long. Its yellow head bears three or more brown spots, one above, and usually one on each side of the head, these spots being often more or less blended. There are twenty-two legs; six true legs, fourteen abdominal and two caudal pro-legs, making twenty-two in all. This will distinguish it from any lepidopterous or moth larva, for none of them living on strawberry has so many legs.

Early in May the eggs are said to be laid in slits cut in the stipule or

leaf-stem of the strawberry leaf. The eggs hatch and the young false-caterpillars attack the leaves. They become full-grown and descend into the ground, making a frail cocoon and there changing to the pupal form ready to come out by the last of July or first of August, as adult saw-flies. These soon mate and lay the eggs for the second brood, which matures and goes into the ground during August or September. The specimens sent us were about ready to go into the ground on September 22, and the larvae disappeared from the fields very soon after that date, going into the ground to spin cocoons and remain until next year.

There is another species of saw-fly, *Monostegia ignota*, that closely resembles the species in question, but the heads of the larvae lack the brown spots already described. The two species, however, are so alike in habits that the same treatment will apply to both.

#### REMEDIES.

As in the case of the strawberry leaf-roller, it is impossible to use any true poisons on the plants after the fruit is set and before it is gathered, but if the worms appear before the plants bloom, a spray of Paris-green and lime will quickly destroy them. After the plants have bloomed and before the fruit begins to ripen, they may be killed with kerosene-emulsion applied very thoroughly so as to strike each worm. It would seem very probable that fine air-slaked lime and sulphur sifted freely over the plants would kill many of the worms, but this remains to be tried. The skins of saw-flies are more or less sticky and tender, and the powdered lime acts as a caustic on them. Lime and sulphur or lime alone is a very convenient remedy to use, because of its cheapness, ease of application (it should be dusted on the plants through coarse bagging), and ease of preparation, the fresh quick-lime requiring only an occasional sprinkling sufficient to slake it, but not to moisten it enough to interfere with its slaking dry.

### 19. THE CRIMSON CLOVER-SEED CHALCID.

(*Bruchophagus funebris*.) \*

When crimson clover was brought to America, it was hoped that a substitute had at last been procured for red clover, a substitute that produced a luxuriant growth and which was free from the many insect ills attendant upon the red clover. There is, nevertheless, a formidable insect foe that has appeared very recently, and which works in the seed. It belongs to the family of hymenopterous parasites known as Chalcididae, almost all of which are our friends. With a few exceptions, all the members of this family feed on other insects, acting as true internal parasites, and help in this way very materially to keep in check noxious species. They are all very small, wasp-like insects, smaller than mosquitos and not conspicuous. The species in question lives in clover seed and is slightly more than one-sixteenth of an inch in length, and black in color. As to its life-history and habits, and the remedies that will control it, very little is known yet. The specimens obtained came

\* Determined by Mr. Wm. Ashmead of Dept. of Agr. Washington, D. C., through kindness of Dr. L. O. Howard.

out on July 12 in quantity, crawling out in swarms on the barn floor from a heap of newly threshed seed.

Prof. A. D. Hopkins of the West Virginia Experiment Station says\* that the insects winter in the clover heads and that they work in the developing seeds of common red clover as well. Before any advice is given for the control of this insect, it will be necessary to determine the number and dates of the broods and considerable more about its life-history than is known now. It is hoped that during the coming summer we may be able to learn more.

## 20. JUMPING OAK-GALL.

(*Neuroterus q-saltatorius*, H. Edw.)

Everybody is familiar with the oak-galls or oak-apples to be found growing on the leaves and twigs of oak trees. Many kinds or species occur in Michigan and each kind is made by a different insect, usually by a member of the family of insects known as Cynipidae. One of these galls or oak-apples is so different from all the others and so curious in itself that it well merits a brief description.†

The galls in question were obtained from Kalamazoo on June 30, 1898, and were sent us by Mr. Hurlburt. Later the same species was found by the writer on the College grounds. The minute galls were to be found in great numbers in tiny pits on the under side of the leaves of the burr-oak (*Quercus macrocarpus*). The form is shown by the accompanying figure (Fig. 20), which is greatly enlarged. The galls themselves are less

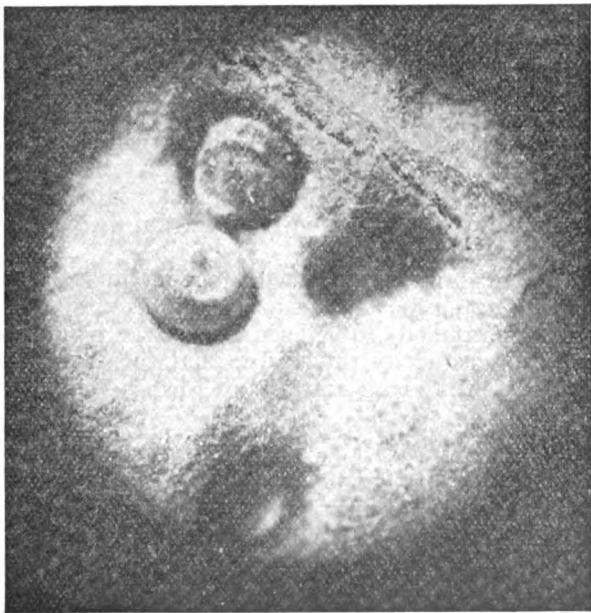


Fig. 20. Jumping Oak-Gall. *Neuroterus q-saltatorius*. (Original.) From a photomicrograph.

\* Proc. 10th Ann. Meeting of Am. Assn. of Econ. Ent. Pub. in Bull. 17. New Series Dept. of Agr. Div. of Ent. 1898. p. 45.

† This insect was kindly identified for me by Dr. L. O. Howard of the Dept. of Agr., Washington, D. C.

than one-sixteenth of an inch in size, and if they were black instead of yellowish white, they would closely resemble small bird-shot. The curious part about the matter is the lively nature of the galls. When the specimens were first received, about a teaspoonful were emptied out on a clean paper and they immediately commenced jumping about, looking something like miniature corn popping. They threw themselves straight up into the air for about half an inch, very many times their own diameter, with the most astonishing vigor. This jumping without legs gives the performance rather a strange appearance. On opening one of the tiny balls, it was found to consist of a very thin papery shell, enclosing a minute white grub, and it is the sudden and convulsive movement of this grub that causes the jumping. The amount of strength required to throw itself to such a height when closely confined in a tight shell is something amazing.

The use of this power or habit is quite apparent; the galls being very delicate and fragile would stand a poor chance if left on the surface of the ground where animals are constantly walking, and being so small and seed-like, might even be eaten by birds; the jumping causes them to be sifted into cracks and crannies where they are protected and where they can pass the winter in comparative safety.

The name of this curious insect is *Neuroterus q-saltatorius* H. Edw.\*

## 21. ANTS IN CORKS.

(*Camponotus herculeaneus*, var. *pennsylvanicus*.)

On August 27, 1898, a peculiar specimen was received from the Sprudel Salt Co. of Mt. Clemens. A bottle that had contained mineral water had been attacked by ants and a passage bored through the cork of sufficient size to allow the contents to escape. Several of the ants were found inside the empty bottle. They proved on examination to be *Camponotus herculeaneus*, var. *pennsylvanicus*. As the damage did not occur at the works of the company, but in a small village in another state, it was impossible to get very much information in regard to the details and extent of the trouble.

The species is one of our common wood-boring ants, a large black insect found in old or decaying logs and stumps, and occasionally in the timbers of our houses. As a remedy to be used in case the trouble should become serious, it was suggested by the writer that the tops of the bottles be dipped in melted sealing-wax or resin to form a coat distasteful to the insects.

## CARBON-BISULPHIDE FOR INSECTS IN SEEDS AND GRAINS.

Seeds infested with insects such as weevils, grain-beetles, meal-beetles, etc., ordinarily are best freed from the pests by the use of carbon-bisulphide.

A careful germination test of beet seed treated with this liquid was made to determine definitely whether it was safe to thus treat beet seed in order to rid it of any insects that might infest it. Three separ-

\* An undetermined *Pteromalid* and *Tetrastichus* sp. were bred from this gall. They were determined by Mr. Wm. Ashmead of the Dept. of Agr., Washington, D. C., through the kindness of Dr. Howard.

ate lots of seed were exposed to two different strengths of the gas for different lengths of time.

In lot No. 1, 100 fruits, each containing from one to seven true seeds were exposed for twenty-four hours to the gas at the rate of two drams of the liquid to a cubic foot of air space.

In lot No. 2, 100 fruits were placed in an atmosphere saturated with the gas for twenty-four hours.

In lot No. 3, 100 fruits were placed in a jar without any of the liquid, as a check on the others.

In lot No. 4, 100 fruits were placed in an atmosphere saturated with the gas for forty-eight hours.

The seeds employed were Vilmorin's Improved.

After the seeds had been subjected to the action of the gas for the required time, they were placed between moist sheets of filter-paper, each lot under a separate bell-jar. In the case of lot No. 1, 93 of the 100 fruits germinated at the end of two weeks; in lot No. 2, 76 germinated; in lot No. 3 (check), 93 germinated; and in lot 4, 50, in the same length of time.

Exposure to the weaker strength (two drams to the cubic foot) somewhat accelerated the germination without injuring the seed, while exposure to the stronger gas killed the seed directly in proportion to the time exposed.

The gas is strong enough when used in the lesser rate to kill all insects and vermin that may infest it. Great care must be employed in using the substance, for it is explosive when lighted and very poisonous to breathe. The seed or grain should be in air-tight bins or barrels, and means should be at hand to close them tightly and quickly. The space in the bin or barrel should be computed, counting in any air-space above the seed, for the gas will occupy the space, too. For every cubic foot of space, one dram of the liquid should be used, for every 100 cubic feet one pound of the liquid will suffice. Shallow pans or dishes should be placed on top of the seed and the liquid poured into them, after which the bins or receptacles should be quickly and tightly closed. Wet blankets and old carpets will do very nicely for this purpose if enough of them are used.

If the seed or grain is more than three or four feet deep, some of the liquid should be poured into it at some depth to ensure its spreading evenly and filling all the space treated. This is easily done with a piece of gas-pipe fitted with a wooden stick for its entire length. The pipe, with the stick in place, filling the hole, is thrust down half way, the stick is withdrawn and the liquid poured down through the pipe. The stick merely prevents the pipe from being filled with grain when pushed into place.

The liquid carbon-bisulphide on being liberated, will be quickly transformed into a gas, which, being heavier than air, settles to the bottom and fills all the air-spaces between the seeds or kernels. The liquid costs about 30 cents for a single pound, or about 10 cents per pound when purchased in 50 lb. lots. It can be used to kill insects in the granary, in the pantry, clothes-moths, and in fact any insect in material that can be placed in trunks, chests, or barrels that can be tightly closed. In general, one dram should be used for a cubic foot of space, as some seeds are injured if subjected to too strong a treatment. The work must be



done in the daytime, away from lamps, stoves, or fires of any sort, and no fires must be allowed to come near it until everything has been aired thoroughly. Grain should be shoveled over several times. Great care must be observed to breathe as little as possible for it is very dangerous and will as easily produce death among men as among insects.

### FORMULAS AND DIRECTIONS FOR USE OF INSECTICIDES.

To be of much service, spraying must be thoroughly done. A conscientious and thorough spraying will wet every part of every limb, twig and leaf on both sides. To accomplish this result cheaply and surely, a spray as fine and mist-like as possible must be used. When a poor nozzle is used, one that projects a coarse spray composed of distinct drops of liquid, much is sure to fall to the ground and be lost. Good nozzles save enough insecticide to pay for themselves in a short time. When contact insecticides, such as kerosene-emulsion or whale-oil soap, are used, each insect must be fairly hit with the liquid to be killed.

Insects that chew or bite their food are usually most cheaply and effectually killed with arsenites, such as Paris-green, while those that suck their food from beneath the surface of the plant have to be killed by contact insecticides, such as kerosene-emulsion, whale-oil soap, etc. In some cases insects that chew have to be killed with contact insecticides; for instance, when they are on fruits or vegetables nearly mature or on which it would be dangerous to use Paris-green because of its poisonous properties.

The pump should be strong and well made, of sufficient capacity to throw the one or two sprays required without too great exertion. An attempt to spray a large orchard with a pump designed for use on small garden plants is discouraging, to say the least.

When large, high trees are to be sprayed, it is often found best to build an elevated stage on top of the wagon-tank or over the barrel containing the liquid. To reach the top of the tree, it is usually best to fasten the nozzle to the tip of a strong bamboo or to attach it to a length of half-inch gas-pipe and send the stream of liquid through the gas-pipe. At least fifteen feet of hose should be allowed in order to reach all parts of the tree.

Never spray a tree when in bloom, it may kill bees, both wild and hive-bees.

Stone fruits require especially careful treatment; they are easily injured by sprays not properly mixed or prepared.

#### INTERNAL POISONS FOR INSECTS THAT CHEW—PARIS-GREEN.

At the head of all the stomach poisons stands Paris-green or arsenite of copper. To prepare Paris-green for spraying, slake one pound of well-burned quick-lime in hot water and stir in one pound of Paris-green. Allow this mixture to stand over night, strain, and then stir it into from 150 to 250 gallons of water. Keep the liquid well stirred while spraying. For most insects, one pound to 200 gallons of water is sufficient, and at this rate it will not injure the plant. Stone fruits, such as peach, plum and cherry, should not receive a spray much stronger than this, but apples, pears, etc., may be sprayed with a mixture considerably stronger, viz.: one pound to 150 gallons of water. Potatoes may be sprayed with

one pound to 100 gallons of water. Paris-green is fairly uniform in composition if not adulterated, and is perhaps the safest and surest remedy for chewing insects as a whole.

#### DRY METHOD.

While ordinarily it is most economical to use Paris-green in the form of a spray, in some instances, where only a few plants are to be treated or where no pump is available, it is expedient to use it as a dry powder. It should then be mixed at the rate of one pound of the poison to 100 pounds of plaster, flour, or air-slaked lime, and dusted on the plants through a sack of burlaps or some loose, coarse cloth. It is best to make the application in the morning when the dew is on the plants. Never apply dry poisons where the wind can blow the powder into pastures or places where cattle or horses are feeding.

#### ARSENITE OF LEAD.

This poison, although not in general use throughout the country, has several advantages; it shows where it has been applied; it is light and does not require such vigorous stirring as Paris-green; it does not easily burn the foliage, and it is cheap. To prepare it, dissolve four ounces of arsenate of soda and eleven ounces of acetate of lead, each in a gallon of water. On mixing the two solutions together we shall get a milky precipitate, which should be stirred into 100 gallons of water. It is now ready for spraying. Of course, larger or smaller quantities may be made in the same proportion, and if this preparation does not seem strong enough, it may be applied much stronger with safety.

Its action is slower than that of Paris-green, but the fact that it does not readily burn foliage is an advantage when spraying various kinds of trees with one mixture.

#### CONTACT INSECTICIDES, FOR INSECTS WHICH SUCK THEIR FOOD.

The most effective contact insecticides are kerosene-emulsion and whale-oil soap. Kerosene-emulsion may be used against all lice (except bark-lice), bugs, etc., which do not succumb to the internal poisons. To be effective it must be very carefully made and conscientiously applied.

Place two gallons of ordinary kerosene in a warm place, either in a warm room or in the sun, and allow it to become as warm as possible without danger from fire. Boil one pound of laundry soap or whale-oil soap in a gallon of soft water until completely dissolved. If the water is the least bit hard, "break" it with washing soda. Remove the soap solution from the fire, and while still boiling hot add the kerosene and agitate for ten minutes, or until the oil is emulsified, with a spraying-pump by forcing the liquid back into the vessel from which it was pumped.

When the liquid is perfectly emulsified it will appear creamy in color and will flow evenly down the side of the vessel. Care should be taken to completely emulsify the oil, and this is accomplished much more easily when the mixture is hot. This strong emulsion may now be readily diluted with water and used, or it may be stored away for future use. When cold it becomes like sour milk in appearance, and

should be dissolved in three or four times its bulk of hot water before diluting with cold water.

Small amounts of this emulsion may be made by using the ingredients in small quantities, but in the same relative proportion.

It should be diluted ten times for most insects, but many plants are able to resist a stronger mixture, which is usually more effective.

#### WHALE OIL SOAP.

This insecticide is rapidly coming into favor. It may be used at the rate of one pound to from four to six gallons of water for plant-lice and many other insects. For winter spraying it is used at the rate of two pounds to a gallon of water. This is the most effective remedy known against the San Jose scale.

Whale-oil soap should cost about four cents per pound when bought in quantity. It requires no preparation other than dissolving in water, and ordinarily is easily applied. Care should be observed to get an article that will not turn to a jelly when dissolved at this rate, for jellied soap is very difficult to spray. The above strength, two pounds to a gallon, should never be applied except in the winter when the trees are entirely dormant, for an application when the buds are swelling or when the leaves are on the tree is sure to do great injury to the tree.

#### PYRETHRUM.

(Buhach or Persian Insect Powder.)

Pyrethrum is a powder made by grinding the heads of a plant resembling our daisy. It is produced in great quantities in California, where it is sold under the proprietary name of "Buhach." It is also imported from Persia and known as "Persian insect-powder." Now, the insecticidal value of the Pyrethrum lies in an oil which readily passes off into the air, and to prevent the loss of this the powder should always be kept tightly sealed in metal cans. Insect-powder that has been exposed for sale in open cans in drug-store windows is next to worthless, and should on no account be purchased. This insect-powder is harmless to all animals breathing by means of lungs. It can be used either dry or in the form of an alcoholic extract. To apply it dry, dust the powder on the insects either by means of a bellows or in some other way. To apply in the form of an extract, place four ounces of the powder in a pint of alcohol, leave it for a week and filter, then dilute once with water, and apply with an atomizer.

#### HELLEBORE.

White hellebore is the powdered root of a plant. It kills both by contact and as an internal poison. It may be applied either dry or in the form of a liquid. When used dry it should be mixed with three or four times its weight of flour or plaster and then dusted on the insects. Applied wet, one pound should be mixed with twenty-five gallons of water and this liquid applied as a spray. A convenient form of duster is made

as follows: A tin box like a pepper-box, holding a quart or less, is fastened to a stick about six feet long by means of a screw running through the bottom of the box into the stick. The cover of this box should be finely perforated to allow the poison to come out very slowly when shaken. This box can then be shaken over the infested plants and the insects peppered or dusted with the poison.

Hellebore is especially useful against all moist-bodied insects, such as currant-worms, pear and cherry-slugs, etc., for the poison sticks to their bodies.

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**OCTOBER, 1899.**

**MICHIGAN**  
**STATE AGRICULTURAL COLLEGE**  
**EXPERIMENT STATION**

**HORTICULTURAL DEPARTMENT**

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**STRAWBERRY NOTES FOR 1899**

---

**By L. R. TAFT and H. P. GLADDEN**

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**AGRICULTURAL COLLEGE, MICHIGAN**  
**1899**



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**1899**



*The Bulletins of this Station are sent free to all newspapers in the State and to such individuals interested in farming as may request them. Address all applications to the Secretary, Agricultural College, Michigan.*

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### SUB-STATIONS

Grayling, Crawford County, 80 acres deeded.  
 South Haven, Van Buren County, 10 acres rented; 5 acres deeded.

## STRAWBERRY NOTES FOR 1899.

---

BY L. R. TAFT AND H. P. GLADDEN.

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For a number of years an endeavor has been made to procure all of the new varieties of strawberries, and originators of new sorts have been urged to send plants of their more promising varieties for trial. In this way we have been able to secure a large number of the kinds that are being brought to the attention of the public by the small fruit plant specialists.

The soil upon we have tested the varieties mentioned in the following bulletin is a moderately heavy loam, which has for a number of years been used for growing vegetable crops. The fertility has been maintained by the use of liberal amounts of stable manure and the land was in a good condition for growing the plants so far as plant food was concerned, although the soil would not be selected as one adapted for small fruit culture.

The plants were set in May, 1898, in rows four feet apart and at intervals of eighteen inches in the rows. One-half of the plants of each variety were allowed to form narrow matted rows, while the remainder were kept in hills. For the most part the number of plants was twenty-five, but in a few instances only twelve were secured.

During the summer of 1898 the plantation received frequent cultivation and an occasional hoeing, and after the ground had frozen a mulch was applied. In the spring the mulch was removed from over the plants and placed between the rows, where it served to keep down the weeds and to hold the moisture. During the first week in June the plants began to show the lack of moisture in the soil and the block which contained the plants on which notes were taken was thoroughly irrigated. The water was applied at the rate of about 800 barrels per acre and was allowed to run down the rows in furrows. After the water had soaked into the ground the mulch was replaced, and the soil was sufficiently moist to the end of the season, and no injurious effect of the dry weather was noticeable. On the other hand, a strip which was not irrigated showed the effect of the dry weather to a marked degree, and the fruiting season was shortened nearly one-half, while the injury to the crop was even greater.

In the following table the characteristics of the varieties are expressed by letters and figures, according to the key that is given at the beginning. The rating of firmness, quality, vigor and productiveness are on the scale of 1 to 10, with ten as a maximum.

Owing to unfavorable conditions, the yield of strawberries was quite unsatisfactory this season. As the plants rarely winter-kill in this section, no mulch was provided last winter for their protection. But owing to the unusual severity of the weather to which they were subjected, a large number of varieties killed out badly and many of the surviving plants were so injured that they could not properly mature their fruit. Hot dry weather during the latter half of June brought the fruiting season to a close several days earlier than usual. However, in spite of these unfavorable conditions some varieties made a very creditable showing; and while in many instances the following tabulation and notes do not represent the true value of varieties under usual conditions, still the record of results obtained may have worth as indicating some of the most reliable sorts.

Among the more productive early varieties were Earliest, Early Jack, Lincoln, Patrick, and Stone. Lincoln is a conical, dark scarlet berry of fair quality. It has been on trial here since 1891, and has not failed to yield well. Patrick lacks somewhat in quality and appearance, but is very productive and is considered worthy of trial as an early market variety.

Among the late and medium late varieties La Crosse, Odessa, Omega, Ridgeway, Sam Sperry, Timbrell, and Tonga gave very satisfactory yields. On the whole, Omega was one of the very best of the late varieties this season. Ridgeway is an attractive berry of good quality and is promising as a medium late home and market sort. Timbrell, in addition to being productive, possesses considerable vigor of plant, but the fruit is rather unattractive in appearance.

The following are descriptions of varieties which fruited here last season for the first time, but which were not described in the sub-station report of last year. Several are varieties originated by crossing a number of well known kinds and were named by uniting the names of the parents. They were received in 1897 from the originator, W. W. Sewall, of Carthage, Mo. The plants were in poor condition when received and fruited very sparsely last year, but this season they had become well enough established to give some indication as to their worth. Several of them seem to have merit both for home use and market.

## SOUTH HAVEN REPORT FOR 1899.

19

## TABULATION OF STRAWBERRIES, 1899.

ABBREVIATIONS—p, pistillate; b, bisexual; c, conical; co, compressed; i, irregular; l, long; o, oblate; ob, oblong; r, round; b, bright; c, crimson; d, dark; l, light; s, scarlet.

SCALE—1 to 10; 1, feeble; 10, very vigorous.

Name.	Sex.	Vigor (1-10).	Date bloom.	Date first pick- ing.	Date last pick- ing.	Productiveness scale (1-10).	Form.	Color.	Quality (1-10).	Texture (1-10).	Weight (oz).
Acem.....	b	7	April 29	May 29	June 12	3	r c	ls	5	6	.16
Arkansas Traveler.....	b	8	May 2	June 7	" 17	5	c co	ds	5	7	.2
Arrow.....	p	8	" 6	" 9	" 17	1	l c	dc	6-7	8	.16
Auburn.....	p	8	" 6	" 9	" 14	4	c co	dc	7	8	.16
Avery.....	p	7-8	April 29	" 5	" 20	6	l c	ds	7	7	.25
Beauty.....	b	5-6	" 29	" 3	" 17	9	r o c	bs	6-7	7	.25
Beecher.....	b	7	May 2	" 9	" 17	5	r	dc	7-8	6-7	.25
Belt 3.....	b	9	" 1	" 7	" 20	8	c co l	s	7	8-9	.33
Beverly.....	b	9-10	" 1	" 5	" 20	8	c co	b c	8-9	8-9	.5
Bob Bubach (3853).....	b	8	" 2	" 7	" 21	8	c co s	s	7	8-9	.33
Brandywine.....	b	6	" 3	" 9	" 20	1	r c	dc	9-10	8-9	.25
Brunette.....	b	6	" 4	" 9	" 20	2	r c l	dc	9	9	.25
Bubach 5.....	p	8	" 2	" 7	" 22	9	c co	s	6	5	.5
Carnot.....	b	6	" 4	" 16	" 22	9	c o l	bs	6	7-8	.25
Carrie.....	p	8	" 1	" 8	" 20	6	c co l	b c	6	7	.25
Carrie Crescent.....	p	10	" 1	" 8	" 26	7	c co	b c	6-7	7	.33
Chairs.....	b	6	" 1	" 7	" 20	8	r c l	ls	4-5	5	.25
Champion.....	b	8	" 1	" 7	" 21	7	l c i	s	3	4-5	.5
Charlie Crescent.....	b	7	" 1	" 5	" 22	7	c co l	c	6	6	.2
Charlie.....	p	8	" 1	" 7	" 23	8	c co	s	6-7	6	.2
Cheyenne.....	p	6	" 4	" 9	" 21	1	i	s	7	6	.25
Cobden Queen.....	p	7-8	" 1	" 7	" 20	7	c co	s	8	7-8	.25
Columbia.....	b	5	" 1	" 11	" 17	8	c co	s	8	7-8	.2
Columbian.....	b	4-5	April 29	" 5	" 21	6	r c	ls	5-6	6-7	.2
Crescent.....	p	8	" 29	May 31	" 20	10	r c	s	5-6	7	.2
Cruse.....	b	6	May 2	June 7	" 22	8	c o l	b d s	7	9	.33
Curtis 15.....	b	7	April 29	" 5	" 24	7	l c co	ls	5-6	4-5	.25
Curtis 159.....	p	9	May 2	" 3	" 20	8	c i	ls	5-6	7	.33
Cyclone.....	b	5	" 1	" 5	" 17	5	l c	c	8-9	8	.2
Daisy.....	p	7	" 1	" 9	" 21	7	c co l	b c	9	7	.25
Dan Bisel.....	b	4-5	" 2	" 7	" 20	7	c i	bs	8	8	.2
Dayton.....	b	4	" 2	" 7	" 17	6-7	c co	ls	5	8	.2
Delia.....	p	4-5	" 6	" 9	" 20	8	r c co	s	8	7	.25
Dollar.....	b	3	April 29	" 7	" 22	6-7	c i	s	7	8	.2
Earliest.....	b	8	" 29	May 29	" 14	7	r c	ls	7	8	.2
Early Jack.....	b	4	" 29	June 2	" 17	9	r o i	bs	2	6	.2
Edgar.....	p	8	May 1	" 7	" 22	8	i	ls	4	5-6	.25
Edwards.....	b	5-6	" 1	" 7	" 23	3	c co l	ds	7	7	.2
Edwards (Fav.).....	b	8	" 3	" 10	" 20	7	c co	ds	6-7	8	.2
Eleanor.....	b	5	" 1	" 3	" 20	7	r o c	c	7-8	6	.2
Enhance.....	b	5	" 4	" 2	" 20	6	o c	b c	8	9	.25
Epping.....	p	6-7	" 3	" 7	" 20	6	c i	s	7	7	.25
Eureka.....	p	6	" 2	" 12	" 17	4	i	ls	7-8	9	.33
Evans.....	b	4	" 1	" 7	" 22	4	r c	s	7-8	7	.2
Faux.....	b	7	" 1	" 7	" 21	7	c o	ds	7	8	.16
Fifer.....	b	8-9	" 1	" 7	" 22	8	c co l	ls	6	7	.16
Fir.....	b	7	" 1	" 8	" 17	7	c co l	b c	8	7	.25
Fountain.....	b	4	" 1	" 8	" 17	5	c co	b c	5	5	.25
Fremont.....	b	7	" 1	" 7	" 20	4	r c co	c	7	7-8	.2
Gardner.....	b	6	" 1	" 5	" 20	7	c co	ds	5	6	.25
Giant.....	b	5	" 1	" 5	" 17	5	i	s	6-7	6-7	.25
Gipsy.....	p	6	" 2	" 3	" 17	4	c co	b d c	8	8	.25
Greenville.....	p	7	" 2	" 7	" 17	6	c co	ds	9	8	.2
Haights.....	b	5-6	" 1	" 5	" 20	8	r c	s	5	8	.16
Hattie Warfield.....	p	8	" 1	" 5	" 20	9	c co	ds	7-8	9	.25

## TABULATION OF STRAWBERRIES, 1899.—Continued.

Name.	Sex.	Vigor (1-10).	Date bloom.	Date first pick- ing.	Date last pick- ing.	Productiveness scale (1-10).	Form.	Color.	Quality (1-10).	Texture (1-10).	Weight (oz.).
Haverland.....	p	7	May 1	June 2	June 17	7	l c c o	s	8	8	.33
Hersey.....	p	5	" 1	" 7	" 17	2	r o	ds	7-8	7	.12
Holland.....	p	6	" 1	" 5	" 20	6	c i	s	3-4	6	.25
Homestead.....	p	6	" 2	" 7	" 17	4	c o o	ds	7	6-7	.14
Hood River.....	b	5	" 6	" 15	" 20	2	r o b	s	6	6-7	.....
Hyslop.....	b	3	April 29	May 31	" 17	2	r c	ds	8	9	.1
Ideal.....	b	7	May 1	June 2	" 20	2	r c	c	5	9	.14
Irene.....	p	7	April 29	" 7	" 23	9	r c	b c	6-7	7-8	.12
Kansas.....	b	6	May 1	" 3	" 20	7	r c i	b d s	7	8	.33
Kennedy (Anna).....	p	6	" 2	" 3	" 20	5	r o	l b s	9	9	.2
Klekita.....	p	7-8	" 2	" 9	" 21	8	r c c o	ls	7-8	4	.2
King Worthy.....	b	6-7	" 2	" 5	" 22	7	c o o	ds	6-7	5	.4
Knight.....	b	6	April 29	" 2	" 17	8	c c o i	bs	3-4	7-8	.33
La Crosse.....	b	7	May 2	" 12	" 24	7	c c o i	ls	6-7	7	.2
Lanahan.....	b	3	" 6	" 9	" 17	1	l c	s	7	9	.11
Laxton No. 1.....	b	5	" 1	" 9	" 15	3	c o o	b c	7-8	8	.12
Lehigh.....	p	8	" 1	" 3	" 20	9-10	r c i	ds	5	7	.2
Leroy.....	p	6	" 1	" 5	" 17	3	r c	c	7	8	.25
Lincoln.....	p	8	April 29	May 29	" 20	8-9	c i	d s	6	5-6	.2
Little 42.....	b	7	May 1	June 2	" 20	6-7	c c o i	ls	6-7	6	.33
Longfield.....	p	7	" 2	" 7	" 17	8	c	l c	8	7	.16
Mamie Warfield (606).....	p	8	" 2	" 5	" 20	8	r c	s	7-8	9	.25
Manwell.....	b	5-6	" 6	" 7	" 20	7	i	d c	6	8-9	.....
Margaret.....	b	6	" 2	" 1	" 17	8	c o o	b c	8	8	.25
Marshall.....	b	6	" 1	" 9	" 17	1	c c o i	b c	8	8	.....
Mary.....	p	4-5	" 1	" 7	" 21	8	c i	c	7	8	.2
Maybrott.....	b	7	April 29	" 3	" 17	8	r c i	d c	5-6	6	.25
Mayflower.....	b	8	May 1	" 5	" 20	7	r c	ls	7-8	9	.2
Meeks.....	b	7	" 1	" 3	" 17	2	r c	d c	7-8	8	.16
Minneola.....	b	4-5	" 6	" 12	" 24	3	i	s	8	8-9	.2
Murray.....	p	3-4	" 4	" 12	" 20	4	i	ds	6	8-9	.14
Noble.....	b	5	" 4	" 12	" 20	7	i	c	8	7	.33
No Name.....	b	9	" 4	" 12	" 22	5	c c o i	ls	7-8	7-8	.25
No. 7.....	b	5-6	" 1	" 12	" 23	7	c o o	ls	7	8-9	.12
No. 8.....	b	10	" 2	" 12	" 21	8-9	i	ls	8	8	.33
No. 40.....	p	6-7	" 2	" 12	" 21	8	i	ls	7-8	8	.25
No. 1000.....	p	3	" 3	" 9	" 20	5	c o o	b c	7	7	.2
Ocean City.....	b	4	" 4	" 12	" 23	4	i	s	6-7	7-8	.25
Odessa.....	b	7	" 4	" 12	" 24	8	c c o i	ls	5	8	.2
Omega.....	p	8	" 4	" 7	" 25	10	c i	ds	7	8	.2
Ona.....	p	7	April 29	" 3	" 17	4	r c	ds	5-6	8-9	.2
Orange Co.....	p	7	May 1	" 5	" 20	7	c o o	ls	6-7	8	.2
Oregon.....	b	5	" 1	" 8	" 21	8	c o o	s	7	8	.2
Oriole.....	p	6	" 1	" 5	" 17	6	l c c o	b c	7-8	8	.25
Orono.....	p	8	" 2	" 7	" 21	7-8	r c c o	b c	8	7-8	.2
Ostego.....	p	8	" 2	" 7	" 22	7	c i	b c	7-8	8	.2
Paris King.....	b	3-4	" 2	" 7	" 21	2	c o o	ls	4-5	6	.2
Patriot.....	b	7-8	" 1	May 31	" 17	9	c o o	s	6	8	.2
Peabody.....	b	6-7	" 1	June 8	" 20	6	c c o i	bs	6	4-5	.2
Perfection.....	p	7	" 2	" 8	" 21	8	i	s	10	8	.33
Pet.....	b	5	April 29	" 7	" 17	6	i	c	7	7-8	.25
Phlipen.....	b	7	May 1	" 7	" 17	4	r c	c	7-8	7	.12
Plow City.....	b	4-5	" 2	" 12	" 20	1	i	l c	6	7	.25
Polly Warfield.....	p	7	" 2	" 7	" 21	8	r c	ls	7-8	8-9	.2
Pride of Cumberland.....	b	4	" 2	" 7	" 20	3	c i	ds	7	6	.16
Princeton.....	b	7	" 1	" 7	" 21	7	r c i	ls	6	7	.2
Ridgeway.....	b	7	" 4	" 12	" 20	8	c o o	ds	8-9	8	.25
Richmond.....	b	4-5	" 2	" 12	" 21	4	c o o	c	8	7	.16
Riehi.....	b	4	" 2	" 12	" 17	3	c c o i	c	8	8-9	.2
Rob Rusk.....	b	7	April 29	" 2	" 14	2	l c c o	c	8	8-9	.2

## TABULATION OF STRAWBERRIES, 1899.—Concluded.

Name.	Sex.	Vigor (1-10).	Date bloom.	Date first pick- ing.	Date last pick- ing.	Productiveness scale (1-10).	Form.	Color.	Quality (1-10).	Texture (1-10)*	Weight (oz.).
Sam Sperry.....	b	9	May 4	June 12	June 24	7	c co	s	7	9	.25
Sandoval.....	b	7	" 1	" 7	" 24	7	r ci	c	6	7-8	.2
Satisfaction.....	b	3	" 1	" 8	" 20	2	c co	bs	7	7	.16
Saunders.....	b	7	" 6	" 10	" 20	7	c co l	ds	9-10	9	.2
Shawnee.....	b	3-4	" 2	" 12	" 17	4	c co l	c	7	6	.2
Sherman.....	b	7	" 1	" 8	" 21	10	r o	bs	5	7-8	.5
Shyster.....	p	4	" 1	" 3	" 20	7	r co l	ds	6-7	5-6	.5
Smalley.....	p	5-6	" 1	" 7	" 21	4	l	lc	4-6	7-8	.2
Smeltzer.....	b	4	April 29	" 3	" 17	5	r o	bc	7-8	8	.2
Sparta.....	b	3-4	" 29	" 8	" 12	1	l	c	7	9	.2
Stahelin.....	p	7	May 1	" 3	" 21	7	c co	bc	8-9	7-8	.33
Star.....	b	6-7	" 2	" 12	" 23	4	c co	ds	7	7	.25
Splendid.....	b	2-3	" 2	" 8	" 21	2	o l	ds	8-9	6-7	.2
Springdale.....	b	3	" 4	" 12	" 20	3	l	s	7	8	.2
Staples.....	b	6	" 1	" 3	" 17	3	r c	ds	8	6	.2
Stewart.....	b	7	April 29	" 2	" 20	2	o l	c	6-7	9	.2
Stone (Ey).....	p	8	May 2	" 2	" 20	7	l ci	ds	6-7	7	.2
Sunnyside.....	p	6-7	" 6	" 10	" 22	4	l	s	7-8	7	.25
Sunrise.....	p	4-5	" 3	" 10	" 20	4	c co	s	7	7	.12
Tennessee.....	b	4	April 29	" 9	" 17	1	l c co	c	7	7	.....
Tennyson.....	b	5	May 1	" 9	" 21	7	r c	ls	7	7	.25
Thompson 40.....	p	8	" 4	" 12	" 23	6	r o	ds	6-7	7	.12
Thompson 66.....	p	9-10	" 4	" 12	" 23	6	l c	c	6	8	.12
Timbrell.....	p	8-9	" 6	" 12	" 24	9	c co	bc	7	7-8	.12
Tonga.....	p	7	" 3	" 12	" 21	8	r	ls	8	7	.2
Topeka.....	b	6-7	" 3	" 12	" 20	4	l c	s	5	10	.12
Tubbs.....	b	8	" 2	" 9	" 21	8	r ci	bc	8	7	.2
Warfield.....	p	8	" 1	" 2	" 17	10	r c	bc	7	8	.2
Welton.....	b	.....	" 1	" 12	" 17	1	r c	bs	7	8	.....
Weston.....	p	.....	" 4	" 12	" 20	2	r	s	7	7	.....
Williams.....	b	8	" 2	" 7	" 20	8	r ci	ds	6	8	.25
Will Warfield.....	b	8	" 2	" 9	" 22	7	c co	bs	7	7	.25
Wood (Beder).....	b	8-9	" 1	" 7	" 20	9	r c	bs	7	7	.2
Woolverton.....	p	9-10	" 8	" 9	" 23	8	ci	bc	8	9	.33
World Champion.....	b	7	" 2	" 3	" 20	4	r c	ds	5	7	.25
Wyatt.....	b	5-6	" 3	" 7	" 20	4	r c	ds	5	7	.25

Bob Bubach.—From W. W. Sewall, Carthage, Mo. Perfect flowered. Plants vigorous, runners abundant, fruit stems short. Fruit large, conical, and slightly compressed; color light crimson; flesh scarlet; texture firm; quality good. This variety resembles Bubach quite closely, both in plant and fruit, but is a little more vigorous in growth.

Carrie Crescent.—From W. W. Sewall. A remarkably vigorous, tall growing plant with broad, dark green leaves. Imperfect flower. Berries large, conical, slightly compressed; color light crimson; seeds large, prominent; flesh scarlet; core open; texture moderately firm; quality good, sprightly. Roots deeply and stands drouth well. If sufficiently productive, it may prove of value as a fancy market sort.

Champion.—From David Strouse, Rogersford, Pa. Moderately vigorous, perfect flowering, plant with light green foliage, inclined to rust. Fruit large, long, conical, somewhat compressed, and often deeply furrowed; color dark scarlet; fruit stalks long, prostrate. Poor quality and soft texture make this variety undesirable either for home use or market.

Evans.—From Thompson's Sons, Rio Vista, Va. Perfect flowered.

Plants low, spreading, strong. Fruit round conical, medium size; color scarlet; texture moderately firm. Not productive enough for market and of doubtful value as a home berry.

Hattie Warfield.—From W. W. Sewall. Plants tall, strong. Imperfect flower. Berry of medium size; conical compressed; deep scarlet color. Plant vigor, good color and appearance of fruit, and fair degree of productiveness give this variety some promise as a market sort.

Mamie Warfield.—From W. W. Sewall. Imperfect flower. Resembles Warfield in plant growth, but ripened three days later than that variety. Fruit roundish conical; color light scarlet; seeds small, deeply sunken. Did not hold out well in size this season.

Maybrott.—From E. J. Hull, Olyphant, Pa. Perfect flowered. Plants medium, upright. Fruit round conical; color crimson; flesh bright scarlet; seeds small, sunken. Of good size; quality rather low, acid. Productive and quite vigorous.

No. 7.—From J. Little, Granton, Ont. Perfect flowered. Fruit rather small, long conical; light scarlet color; firm; good quality. Productiveness fair to good.

No. 8.—From J. Little. A very vigorous perfect blooming plant, with dark green foliage, productive of large irregular berries of firm texture and light crimson color. Flesh pink; very good quality.

No. 40.—From J. Little. Imperfect flower. Plants vigorous, foliage light green; fruit stems long, prostrate. Berry irregular; color light scarlet; flesh pink; seeds numerous, reddish, slightly sunken; texture firm. Quite productive, but fruit is sometimes lacking in color.

Omega.—From Thompson's Sons. Plants tall, vigorous. Imperfect flower. Berry large, conical, somewhat irregular; flesh light scarlet; texture a little soft; quality good. Runners abundant, a good plant maker. One of the best late ripening varieties tested this season.

Pet.—From E. J. Hull. Perfect flowered. Somewhat lacking in productiveness. Plants tall, spreading; runners fairly abundant; fruit stalks long, prostrate. Fruit medium size, irregular; crimson color; a little soft; very good quality.

Polly Warfield.—From W. W. Sewall. Imperfect flower. Fruit round conical; light scarlet color; firm; good quality. Fruit stems upright holding berries well up from ground. Plants tall, upright, thrifty. Berries did not hold out well in size.

Rob Rusk.—From W. W. Sewall. Perfect flowered. Lacks vigor and productiveness. Plants upright, runners numerous, fruit stalks slender, upright. Berry round conical, compressed; color crimson; flesh scarlet; seeds medium, slightly sunken; texture quite firm; quality rather low.

San Sperry.—From W. W. Sewall. Plants low, spreading, perfect. Fruit is of very good appearance; form conical, compressed; color bright scarlet; flesh scarlet; seeds vary from yellow to purple in color; texture very firm. May prove valuable as a medium late home and market berry. Ripened June 12.

Shyster.—From Thompson's Sons. Plants somewhat lacking in vigor, imperfect. The fruit is rather irregular in form and often of poor appearance. Color dark scarlet; flesh bright scarlet; seeds medium, quite deeply sunken; texture firm; quality rather low. Productiveness fair.

Will Warfield.—From W. W. Sewall. Perfect flowered. Ripened a week later than Warfield. Plant strong, upright; runners numerous;

fruit stalks medium, upright. Fruit compressed conical; color bright scarlet; flesh light scarlet; seeds yellow, slightly sunken; texture firm. Considered promising as a market variety. Quite productive.

World Champion.—From E. J. Hull. Imperfect flower. Plants medium to tall, slightly spreading. Fruit round conical; color crimson; seeds medium, slightly sunken; flesh scarlet. A berry of good appearance but acid and quite soft.

### RASPBERRIES.

Winter injury to raspberries, except in the case of a few varieties, was slight. Among the black caps Conrath, Cromwell, Gregg, Mills (15) and Palmer were killed back from one-fourth to one-third, but recovered sufficiently to yield fair crops of fruit. All other black caps, together with the red varieties and purple cane class, escaped uninjured, except for the freezing of the tips. The ordinary spring pruning, or heading in, removed practically all of this injured wood.

Early in spring the plants were sprayed with a solution of one pound of copper sulphate to twenty gallons of water. After growth had started they were again sprayed, this time with Bordeaux mixture. To the Bordeaux was added Paris green, three ounces to forty gallons, to destroy the larvæ of the sawfly (*Monophadnus rubi*), which appeared in considerable numbers and fed on the foliage of the plants. An examination some days later showed the insects, although reduced in numbers, to be still persisting in their work and another application of Bordeaux mixture and Paris green was made. This proved sufficient to rid the plants of the pest. The sprayings also served to hold the anthracnose well in check. Although it was present to a slight extent on the old canes of a few varieties, it did not attack the new growth during the season.

Rains occurred at intervals during the fruiting season and in this, as well as in most other respects, conditions were favorable for a good yield of fruit.

### RED VARIETIES.

Of this class Church, Cuthbert, Loudon, and Marlboro were among the most productive. Church, as stated in Bulletin 152 of the substation, at first lacked vigor and productiveness here. It has improved in both these characteristics but the fact that it crumbles badly in picking is quite a strong objection to it.

Loudon, since coming into fruiting, has not failed to be productive, but the plants are not very thrifty growers and the average yields of this variety being proportionate to the growth of the plants would fall considerably short of the yields of some of the stronger growing kinds. However, in nearly all other respects the variety is a good one and the matter of yield can be helped out by setting the plants closer together than raspberries are commonly set.

Sarah is a new variety, somewhat lacking in vigor and productiveness. The fruit is of good size, roundish oblate, vinous and rather rich, but a little dry. Quality rather low.



## BLACK CAPS.

Cumberland, Diamond, Eureka, Farnsworth, Idaho, and Kansas were among the more productive of the black varieties.

Cumberland fruited here this season for the first time. The plants are vigorous in growth and very productive. Berries large, firm, juicy, and of a sweet, rich flavor. This variety possesses such a combination of good qualities as seem likely to make it a popular home and market berry.

Diamond is a strong upright grower, productive of medium to large fruit. It is a good market sort.

Eureka ripens over quite a long season and holds out well in size of fruit.

Farnsworth is a very vigorous grower. The fruit is of medium size and quite firm.

Idaho was one of the best late varieties fruited this season. The berries are of large size, very firm, and of attractive appearance.

Kansas, although productive this season, was too small to take well in market.

Livingston was quite productive. The berries are rather small, roundish, slightly oblate, moderately juicy, and of a mild, rich flavor. The plants are strong and vigorous. Requires further trial.

Ransom Everbearing first fruited here this season, and needs further trial. The plants are only moderately vigorous. The berries are small, roundish oblate, mild, rich, of fair quality.

## PURPLE CAPS.

Columbian has fruited here three seasons and has not failed during that time to give good results.

Gladstone is vigorous in growth and the fruit is of good quality. However, the berries are apt to run small in size and they crumble badly in picking.

Muskingum fruited heavily this season. The berries are of large size and of quite good quality.

Redfield yielded well, but the berries were rather small.

Otis appears to be identical with Columbian.

## RASPBERRY NOVELTIES.

Logan Berry. This variety was received for trial in 1895, but bore no fruit until this season, although it has been protected each winter and otherwise given good care. The plant is a slow grower of trailing habit. The berries are much larger than the common raspberry, and of a reddish purple color; texture soft; flavor mild, sub-acid, raspberry like; quality rather low. It does not appear to have any value in this section.

Rubus Xanthocarpus. Received from the Division of Pomology, Washington, D. C. The plant is a native of Russia. In habit it is low and spreading, like the Strawberry-Raspberry which it somewhat resembles in growth of plant. It dies to the ground in autumn and comes up from the roots again the following spring. The plants blossomed last spring but set no fruit.

## TABULATION OF RASPBERRIES, 1899.

ABBREVIATIONS.—c, conical; o, oblate; ob oblong; r, roundish; b, blackish; p, pubescent; pu, purplish; r, red; y, yellow.

Name.	Species.	Bloom.	First picking.	Last picking.	Product (1-10).	Form.	Color.	Average weight (ounces).	Quality (1-10).
Brandywine.....	Strigosus.....	June 8	July 10	July 28	7	r	r	.05	7-8
Cardinal.....	Neglectus.....	" 2	" 1	" 28	9	rc	r	.05	6
Carman.....	Occidentalis.....	May 27	June 27	" 12	8	r	b	.025	6
Caroline.....	Neglectus.....	June 2	July 1	" 28	9	r	y	.037	2
Centennial.....	Occidentalis.....	May 29	June 30	" 28	8	r	b	.05	6
Church.....	Strigosus.....	June 2	July 5	" 28	8	r	r	.075	7-8
Clark.....	Occidentalis.....	May 22	June 27	" 15	8	r	p	.025	5
Columbian.....	Neglectus.....	June 5	July 8	" 28	10	rc	b	.002	5
Conrath.....	Occidentalis.....	" 1	" 1	" 20	7	r	b	.037	6
Cromwell.....	Occidentalis.....	May 25	June 27	" 15	7	r	b	.025	4-5
Cumberland.....	Occidentalis.....	" 31	July 5	" 25	10	r	b	.002	7
Cuthbert.....	Strigosus.....	June 5	" 6	" 25	8	c	r	.007	5-6
Diamond.....	Occidentalis.....	" 1	" 6	" 25	9	r	b	.05	7
Doolittle.....	Occidentalis.....	May 27	June 27	" 20	9	r	b	.037	4-5
Early King.....	Strigosus.....	" 31	" 27	" 25	7	ro	r	.037	7
Emmet.....	Neglectus.....	June 6	July 6	" 28	7	r	r	.075	3-4
Eureka.....	Occidentalis.....	May 27	" 1	" 25	10	ro	b	.05	5-6
Farnsworth.....	Occidentalis.....	" 30	" 6	" 20	9	r	b	.037	4-5
Gladstone.....	Neglectus.....	" 29	" 5	" 22	9	rc	pu	.037	5
Golden Queen.....	Strigosus.....	June 6	" 8	" 28	8	rc	y	.025	6-7
Gregg.....	Occidentalis.....	May 31	" 6	" 25	9	r	b	.037	8
Green.....	Occidentalis.....	" 29	" 27	" 20	9	ro	b	.037	7
Hansell.....	Strigosus.....	" 30	June 24	" 20	8	r	r	.037	6
Heraftine.....	Idæus hyb?.....	June 2	July 1	Aug. 15	6	rob	r	.062	9
Hilborn.....	Occidentalis.....	May 30	" 6	July 20	9	r	b	.037	5-6
Idaho.....	Occidentalis.....	June 2	" 8	" 25	10	ro	b	.05	6
Indiana.....	Occidentalis.....	May 27	" 6	" 20	8	ro	b	.05	5
Jap. Wineberry.....	Phoenicolasus.....	June 15	Aug. 7	Aug. 30	8	ro	r	.....	1
Johnston.....	Occidentalis.....	May 31	July 10	July 22	8	ro	b	.037	7
Kansas.....	Occidentalis.....	" 29	" 1	" 20	8	ro	b	.05	4
Kenyon.....	Strigosus.....	June 5	" 6	" 25	9	r	r	.075	5
Livingston.....	Occidentalis.....	May 31	" 6	" 10	8	ro	b	.037	5
Logan.....	Vit. x Idæus?.....	" 31	" 10	" 20	6	lc	r	.125	4-5
Loudon.....	Strigosus.....	June 2	" 6	" 25	9	rc	r	.075	5
Lovett.....	Occidentalis.....	May 27	" 1	" 20	8	ro	b	.037	10
Marlboro.....	Strigosus x Idæus.....	" 31	June 30	" 25	8	rc	r	.062	6
Miller.....	Strigosus.....	" 31	July 1	" 25	6	ro	b	.037	7-8
Mills 15.....	Occidentalis.....	" 31	" 6	" 25	7	rc	b	.037	5-6
Munger.....	Strigosus.....	June 2	" 10	" 25	2	r	r	.062	3-4
Muskingum.....	Neglectus.....	" 6	" 6	" 22	9	r	pu	.067	4-5
Nemaha.....	Occidentalis.....	" 2	" 10	" 22	5	ro	b	.05	5-6
Ohio.....	Occidentalis.....	May 27	" 1	" 22	10	ro	b	.025	6
Older.....	Occidentalis.....	" 27	June 27	" 20	9	ro	b	.037	5
Otis.....	Neglectus.....	June 6	July 10	" 28	10	r	pu	.075	5
Palmer.....	Occidentalis.....	May 27	June 27	" 20	9	r	b	.037	7
Phoenix.....	Strigosus.....	June 5	July 10	" 28	8	ro	r	.075	6-7
Progress.....	Occidentalis.....	May 29	" 6	" 16	9	r	b	.025	5
Redfield.....	Neglectus.....	June 6	" 1	" 20	9	r	pu	.037	3
Rerder.....	Strigosus.....	" 5	June 30	" 28	7	ro	r	.05	8
Reliance.....	Strigosus.....	" 6	July 6	" 28	5	r	r	.037	4-5
Sarah.....	Strigosus.....	" 8	" 10	" 28	4	ro	r	.062	4-5
Shaffer.....	Neglectus.....	" 5	" 6	" 28	7	r	pu	.062	5-6
Smith Giant.....	Occidentalis.....	" 5	" 10	" 25	9	r	b	.062	5-6
Smith Prolific.....	Occidentalis.....	May 31	" 6	" 22	6	ro	b	.05	8-9

TABULATION OF RASPBERRIES, 1899.—*Concluded.*

Name.	Species.	Bloom.	First picking.	Last picking.	Product (1-10).	Form.	Color.	Average weight (ounces).	Quality (1-10).
Souhegan.....	Occidentalis.....	May 27	June 27	July 16	8	ro	b	.037	7
Strawberry-raspberry..	Rossifolius.....	June 10	July 16	Aug. 10	8	o	r	.2	2
Superlative.....	Idæus.....	May 29	" 1	July 28	7	o	r	.067	2.4
Thompson.....	Strigosus.....	" 31	June 27	" 20	1	ro	r	.025	4.5
Thwack.....	Strigosus.....	June 2	July 6	" 28	8	r	r	.075	6
Turner.....	Strigosus.....	" 5	June 30	" 20	8	ro	r	.037	8
Tyler.....	Occidentalis.....	May 29	" 27	" 17	8	r	b	.025	6
Winona.....	Occidentalis.....	" 27	July 1	" 16	9	ro	b	.025	4.5

## BLACKBERRIES.

The canes of a number of varieties of blackberries were quite badly injured by the winter, as were also the roots in some instances. Not only did this injury materially lessen the crop this season, but in the case of the root-injured varieties few new shoots were sent up and there is but little fruiting wood for another year, so the next crop must necessarily be light also.

Childs Tree and Early Harvest were killed to the ground. Agawam, Early King, Maxwell, Thompson, Wilson, and Wilson Jr., were badly frozen back, but bore some fruit. Ancient Briton, Eldorado, Lincoln, Nevada, Sanford, Snyder, and Taylor were among the varieties least injured. The extent of winter injury in the case of each variety is further indicated in the tabulation.

Among the varieties which gave the most satisfactory results this season were Eldorado, Fruitland, Lawton, Lincoln, and Wallace. Eldorado is a spreading, moderate grower, hardy, and very productive. The fruit was inclined to be rather small after the first half of the fruiting season.

Fruitland was among the best of the late sorts. Lawton, although somewhat injured by the winter made a very good showing. The berries were large and attractive. Lincoln is a large oblong somewhat irregular shaped berry of good quality. Wallace yielded nearly a full crop and the fruit held out well in size to the end of the season. Snyder and Taylor, although only slightly injured by the winter yielded but little fruit. Thompson bore fruit of larger size than any other variety, but was so badly winter-killed that the yield was very light.

## TABULATION OF BLACKBERRIES, 1899.

ABBREVIATIONS—i, irregular; o, oblong; ov, oval; r, roundish; b, black.

Name.	Bloom.	First picking.	Last picking.	Product (1-10).	Form.	Weight in oz.	Quality (1-10).	Injury by winter.
Agawam.....	May 29	July 22	Aug. 5	2	o	.15	8	Killed nearly to ground.
Ancient Briton.....	" 29	" 20	" 10	7	o i	.11	7	Tips killed.
Childs Tree.....								Killed to ground.
Early Harvest.....								Killed to ground.
Early King.....	" 31	" 12	" 1	3	ov i	.15	9	Killed back two thirds.
Early Mammoth.....	" 29	" 14	" 5	8	o	.17	7	Killed back one third.
Eldorado.....	" 27	" 14	" 5	10	o	.12	7-8	Slightly injured.
Erie.....	June 2	" 20	" 20	7	ov	.13	7	Killed back one third.
Fruitland.....	" 5	" 25	" 5	7	ro	.10	8	Killed back one third.
Kittatinny.....	" 2	" 29	" 15	7	o	.13	6	Killed back one half.
Knox.....	May 31	" 14	" 18	7	o i	.15	7	Killed back one third.
Lawton.....	" 29	" 18	" 18	8	o	.12	7	Killed back one third.
Lincoln.....	" 29	" 20	" 5	9	ov	.10	7	Tips killed.
Lovett.....	June 6	" 28	" 5	2	ov i	.07	6	Badly injured.
Maxwell.....	" 5	" 13	" 20	3	o i	.17	6	Killed nearly to ground.
Minnewaska.....	" 5	" 18	" 18	3	ro	.17	6	Killed back one third.
Nevada.....	" 2	" 20	" 20	5	o	.14	7-8	Slightly injured.
Ohmer.....	" 19	Aug. 7	" 26	5	ro v	.10	6	Killed back one third.
Oregon (Everbearing).....	" 15	" 18	Sept. 5	10	o	.10	4	Uninjured.
Plaza.....	May 29	July 18	Aug. 5	6	o i	.12	6	Killed back one fourth.
Reyner.....	" 29	" 24	" 5	3	o i	.10	8	Killed back one fourth.
Sanford.....	" 27	" 22	" 5	5	ro v	.07	8	Slightly injured.
Snyder.....	" 27	" 18	" 5	3	ro	.10	7	Tips killed.
Taylor.....	" 29	" 21	" 12	3	o	.07	8	Tips killed.
Thompson.....	" 29	" 14	" 5	3	o i	.15	5	Killed nearly to ground.
Triumph (Western).....	" 29	" 22	" 5	8	o	.09	7-8	Slightly injured.
Wallace.....	" 31	" 14	" 15	9	o i	.11	8	Killed back one third.
Wilson.....	" 29	" 13	" 5	5	o i	.20	5	Killed back one half.
Wilson, Jr.....	" 29	" 13	" 5	4	o i	.17	5	Killed back one half.

## CURRANTS.

Most varieties of currants fruited well this season, but in the case of a few sorts the yield was light, owing to imperfect setting of the fruit, the bunches being quite loose.

The treatment given the plants differed but little from that of former seasons. In early spring they were sprayed with a solution of copper sulphate and later when growth had started an application of Bordeaux mixture and Paris green was made to prevent the attack of fungi and to destroy the worms which were just beginning to make their appearance.

## NOTES ON VARIETIES.

Cherry made a good growth and produced a fair amount of fruit. The clusters were large and well filled. Fay which resembles the Cherry closely in plant and fruit, gave results quite similar to that variety. Holland bore a good many loose imperfect clusters and the berries were quite small. The plants were attacked by aphides in early summer and were sprayed with kerosene emulsion to destroy the pest. This variety is quite subject to the attack of plant lice.

Lancaster is a new variety which bore its first fruit here this season. The clusters were compact, but rather small. Berries medium in size, of good quality. Requires further trial.

London which has received favorable mention in former reports, again gave good results. From the standpoint of a market variety, this is one of the best in the sub-station collection.

Pomona failed to make a very good showing because of the number of imperfect clusters borne. However, size and quality of the fruit are in its favor. It is a new variety and requires further trial. Red Dutch lacked productiveness. The plants are very strong growers, and the fruit which is of good quality is borne in rather compact medium sized clusters. White Dutch, recognized as one of the best of the white varieties, bore a full crop. Wilder was one of the most productive of the large-fruited kinds. The plants are quite tall and vigorous. The fruit is borne in long compact clusters. Quality very good.

TABULATION OF CURRANTS, 1899.

KEY.—Form—r, roundish. Color—b, black; r, red; w, white. Use—d, dessert; k, kitchen; m, market

Name.	Origin.	Planted.	Bloom.	Ripe.	Productiveness (1-10).	Form.	Color.	Quality.	Vigor.	Weight in oz.	Use.
Champion.....	England.....	1899	May 2	July 14	5	r	b	6	8	.11	k m
Cherry.....	Europe.....	1884	April 27	" 6	7	r	r	5	7	.21	k m
English.....	England.....	1892	May 2	" 14	8	r	b	4	10	.13	k m
Fay.....	New York.....	1882	April 27	" 6	6	r	r	6	5	.28	k m
Holland.....	Europe.....	1889	" 29	" 11	8	r	r	4	7	.14	k m
Lakewood.....	Ohio.....	1860	" 28	" 11	10	r	r	5	8	.24	k m
Lancaster.....	.....	1898	" 30	" 12	4	r	w	8	7	.15	k d
Lee.....	America.....	1888	May 3	" 14	5	r	b	3-4	5	.12	k m
London.....	England.....	1890	April 29	" 6	9	r	r	4-5	10	.20	k m
North Star.....	Minnesota.....	1890	" 28	" 11	5	r	r	7-8	10	.14	k m
Pomona.....	Indiana.....	1897	" 28	" 11	5	r	r	6-7	5	.20	k m
Red Dutch.....	Europe.....	1888	" 27	" 11	5	r	r	7-8	10	.20	k m
Ruby Castle.....	Europe.....	1892	" 28	" 11	9	r	r	5	9	.17	k m
Ruby, Moore.....	New York.....	1890	" 28	" 6	9	r	r	8	6	.27	k m
Saunders.....	Ontario.....	1890	May 2	" 14	9	r	b	3-4	8	.10	k m
Select, Moore.....	Massachusetts.....	1890	April 27	" 6	5	r	r	5	7	.26	k m
Versaillaise.....	France.....	1888	" 27	" 6	10	r	r	6	8	.16	k m
Victoria.....	England.....	1888	" 29	" 11	7	r	r	5-6	9	.19	k m
Wales, Prince of.....	Ontario.....	1890	May 1	" 14	5	r	b	5-6	10	.12	k m
White Dutch.....	Europe.....	1888	April 28	" 11	5	r	w	10	9	.16	k d
White Gondoin.....	Europe.....	1890	" 29	" 11	10	r	w	9	7	.24	k d
White Grape.....	Europe.....	1888	" 28	" 11	8	r	w	8	9	.21	k m
Wilder.....	New York.....	1890	" 28	" 11	9	r	r	6	10	.29	k m

## GOOSEBERRIES.

Soon after the leaves had opened on the gooseberries in the spring, the plants were sprayed with Bordeaux mixture and Paris green and about two weeks later a second application was made.

These early sprayings were followed by applications of potassium sulphide, three ounces to ten gallons of water, for the purpose of holding the mildew in check. The first application was made June 1, and from that time until after the fruit had been picked applications were made

at intervals of about ten days. Although the disease made its appearance on several English varieties, the spray prevented any serious injury either to plants or fruit.

All the English varieties except Orange and Champion bore good crops. Keepsake gave better results than any other variety, taking yield and size of fruit into consideration. Some single specimens weighed half an ounce. Lancashire made nearly as good a showing and Auburn, Chautauqua, Columbus and Triumph were fully as productive if not quite so good in other respects.

A number of the American kinds were quite unproductive, as was the case last year. Houghton yielded almost no fruit while Downing produced only about half a crop. Pearl was the most productive variety, but the yield did not amount to a full crop. Red Jacket and Smith stood next in productiveness.

All fruit not needed for experimental purposes was marketed this season as has been the custom in former years. The English gooseberries sold in Chicago at from \$1.25 to \$1.50 per sixteen quart case which was about double the price received for American berries shipped at the same time. This difference in prices usually exists and will well repay the extra labor of spraying the English varieties to prevent mildew. There is little doubt but that they can be raised with profit if given the right kind of care. Next spring it is proposed to set out a new plantation of one hundred plants each of about half a dozen of the better English kinds in order to test them more thoroughly from a commercial standpoint.

TABULATION OF GOOSEBERRIES, 1899.

KEY.—Form—l, long; o, oval; r, round. Color—g, green; r, red; w, white; y, yellow.

Name.	Species.	Planted.	Bloomed.	Ripened.	Form.	Color.	Weight in oz.	Productiveness (1-10).	Quality (1-10).	Vigor (1-10).
Apex.....	Grossularia.....	1893	April 28	July 11	o	y g	.21	10	8-9	7-8
Auburn.....	Grossularia.....	1890	" 28	" 11	o	y r	.27	10	8-9	8-9
Bendelon.....	Grossularia.....	1894	" 29	" 11	o	y g	.21	10	5	5
Champion.....	Grossularia.....	1891	" 29	" 11	ro	y g	.14	7	6	10
Chautauqua.....	Grossularia.....	1892	" 28	" 6	ro	y g	.27	10	8-9	7-8
Columbus.....	Grossularia.....	1894	" 28	" 6	ro	y g	.31	10	10	7-8
Downing.....	Oxyacanthoides.....	1888	" 28	" 11	ro	w g	.18	5	7	10
Golden (Prolif.).....	Grossularia.....	1891	" 28	" 11	o	y	.20	9	6-7	8
Houghton.....	Oxyacanthoides.....	1888	" 29	" 11	ro	r	.07	1	10	10
Industry.....	Grossularia.....	1899	" 28	" 11	ro	r	.29	10	6-7	5
Keepsake.....	Grossularia.....	1894	" 28	" 6	o	g w	.31	10	8-9	5-6
Lancashire.....	Grossularia.....	1894	" 28	" 11	ro	r	.29	10	7-8	8
Orange.....	Grossularia.....	1890	" 28	" 11	ro	y	.06	1	10	10
Pale Red.....	Oxyacanthoides.....	1890	" 29	" 11	ro	r	.07	3	9	10
Pearl.....	Oxyacanthoides.....	1890	" 28	" 11	ro	g	.12	8	9	7-8
Red Jacket.....	Oxyacanthoides.....	1890	" 29	" 11	ro	r g	.17	7	7-8	8
Smith.....	Oxyacanthoides.....	1888	" 28	" 11	o	g	.12	6	8-9	2
Strubler.....	Cynosbati.....	1892	" 28	" 11	ro	g y	.10	5	7-8	3
Tree.....	Cynosbati.....	1892	May 1	" 10	ro	r	.10	2	5-6	10
Triumph.....	Grossularia.....	1890	April 28	" 6	ro	g y	.26	10	7-8	7-8

## CHERRIES.

All varieties of cherries came through the winter without the slightest injury and the crop this season at the sub-station was larger than ever before.

Cherries in common with other fruits, have been given clean culture since they were first planted, with the exception of a small block of sixty trees. This block which is made up of thirty-three sweet and sour varieties was seeded down two years ago for the purpose of checking too rapid growth of the trees and thus preventing bark burst to which the sweet kinds especially are liable. The growth of the trees has been checked but the orchard will be left unplowed, for at least another year for further comparison with trees under cultivation. This fall the trees in sod were given an application of wood ashes and ground bone, while the cultivated trees will receive no fertilizer beyond what may arise from the turning under of what promises to be a fair stand of crimson clover.

Early in the spring the trees were sprayed with a solution of one pound of copper sulphate to fifteen gallons of water. When the fruit had set, an application of Bordeaux mixture and Paris green was made. About the middle of summer the sweet cherries were again sprayed with Bordeaux mixture with the idea of preventing premature falling of the leaves due to the attack of shot hole fungus. This apparently had the desired effect for, although the disease had appeared to a slight extent on a few trees before they were given this summer spraying, it did not become prevalent and the foliage for the most part held on well until autumn.

## MORELLOS.

Baendor is a new variety which first fruited here this season. The tree is moderately vigorous with a round, spreading head. The fruit is roundish heart-shaped; medium size; dark red in skin and flesh; of good quality. Has been rather slow in coming into bearing and the crop this season was light.

Bessarabian, Dyehouse, Franendorfer, Lithauen, Montmorency, Northwest, Ostheim, Ostheimer, Richmond, Sklanka, Spate Morello and Suda, bore very full crops. A number of them are Russian varieties, most of which have heretofore been quite unproductive.

Among the twenty-seven varieties of sour cherries now on trial, Montmorency still maintains its standing as one of the most valuable home and market sorts. Brusseler Braune, a late-ripening Russian variety, is coming into favor because of size and beauty of fruit and vigor of tree. It lacked somewhat in productiveness this season.

## DUKES.

Galopin is a new Duke variety, trees of which were received in 1891. The fruit is roundish oblate; stalk stout, one and one-half inches long, set in a medium cavity; color light red; flavor sub-acid, pleasant; flesh tender and of good quality. Tree vigorous, with spreading head.

Rupp is an upright, spreading, vigorous grower. Fruit roundish, elongated, suture marked by a line; stalk one and three-fourths inches long, moderately stout, set in a broad, deep, somewhat irregular cavity;

color light yellow, mottled and marbled with dull red; flavor sub-acid, rich; flesh light colored, moderately firm; quality very good. This is a new variety received for trial in 1894.

Several of the Duke varieties were rather unproductive this season, but the following gave satisfactory yields: *Carnation*, *Hortense*, *Magnifique*, *Montrueil* and *Olivet*.

*Carnation* is a large dark red cherry of very good quality. Although it was one of the most productive kinds last year, it again bore a full crop this season. *Hortense* and *Olivet* did not bear so much fruit as the other varieties mentioned, but the yield was considerably larger than in former years. *Montrueil* has not only proven an early and productive variety, but the fruit is of large size, attractive appearance and good quality. A valuable variety for home use or market.

#### HEARTS AND BIGARRÉAUS.

*Badacsony*, *Baltavar*, and *Mednyansky* are Hungarian varieties, scions of which were received in 1894. They gave good results this season and are considered promising. All are firm fleshed varieties of good quality. The two first mentioned were described in the report of last year, while the third is given more extended mention below. It will be observed upon comparison with last year's report that a slight change has been made in the spelling of the names of the varieties, which is in accordance with a revision made since the scions were received.

*La Maurie* is a new early variety which this season ripened only two days later than *Early Purple*. Tree upright, slightly spreading, moderately vigorous. Fruit obtuse, heart-shaped, slightly compressed, suture obscure; stalk slender, one and one-half inches long, set in a shallow cavity; color dark purple, almost black when fully ripe; flavor sweet, mild; texture tender, juicy; quality fairly good. Requires further trial but will need to improve very much in size to be counted of value.

*Mednyansky*.—Tree upright, spreading, quite vigorous; with large drooping leaves. Fruit heart-shaped, suture variable, in some specimens indistinct, in others marked by a well defined ridge from cavity to apex; stalk stout, one and one-fourth inches long, set in a narrow, deep, irregular cavity; color very dark purple turning to black in exposed and fully matured specimens; flavor sweet, sprightly, rich; texture very firm; quality very good. Inclined to be a little bitter before fully ripe. The fruit was not quite uniform in size, some specimens being large while others were below medium in size. Aside from this, the variety made an excellent showing this season.

*Purity*.—Tree upright, spreading, fairly vigorous. Ripe June 24. Fruit heart-shaped, compressed; suture broad half around, rather indistinct; stalk one and one-half inches long, slender, set in a broad shallow cavity; color amber, shaded and marbled with bright red; skin thin, showing netted texture of flesh; flavor rich, sweet; texture tender, juicy, melting; quality very good. Rather tender for a market fruit, but further trial may show it to be of value for home use.

*Schmidt*.—Tree upright, spreading, very vigorous. Fruit obtuse heart-shaped, slightly compressed; stalk stout, one and one-half inches long, set in a broad deep cavity; color dull red, mottled and marbled with carmine; flavor vinous, sweet; texture very firm; quality good. A very handsome fruit, and likely to prove of value if productive.



Ulatis (California Advance).—Tree very vigorous with round, spreading head. Fruit heart-shaped, slightly compressed, suture somewhat obscure; stalk stout, one and one-half inches long, set in a round rather deep cavity; color dark, rich, glossy, purple; flavor sweet, vinous; flesh purple, tender juicy; quality very good. A cherry of large size and attractive appearance.

Cleveland, Coe, Eagle, Elton, Ida, Mary Kirtland, Napoleon, Rockport, Spanish, Tartarian, Windsor and Gov. Wood, deserve mention as among the more productive kinds. Ida is a new variety which received favorable mention in the report of last year. Not only was the crop this season a large one but in other respects the variety again showed itself to be of value. Windsor is also a comparatively new variety which has rapidly grown in favor. The crop this year in no wise detracted from the opinion of its worth expressed in the last two reports of the sub-station.

TABULATION OF CHERRIES, 1899.

Name.	Species.	Planted.	Bloomed.	Ripened.	Weight of berry in ounces.	Productiveness. — Scale 1-10	Quality.—Scale 1-10.	Vigor.—Scale 1-10.
Angouleme.....	Duke.....	1888	April 29	July 12	.17	2	8	10
Badacsony.....	Avium.....	1894	" 28	June 29	.20	6	8	9
Bsendor.....	Morello.....	1892	May 1	July 1	.12	1	6-7	6-7
Baltavar.....	Avium.....	1894	April 28	June 28	.22	5	8-9	9-10
Bessarabian.....	Morello.....	1888	" 29	July 3	.11	10	5	10
Brusseler Braune.....	Morello.....	1888	May 1	" 13	.15	6	7-8	10
Carnation.....	Duke.....	1891	April 29	June 30	.15	9	7-8	10
Centennial.....	Avium.....	1893	" 28	" 19	.20	3	7	6
Choisy.....	Duke.....	1888	" 29	" 24	.12	1	10	6
Cleveland.....	Avium.....	1888	" 29	" 18	.16	8	7-8	8
Coe.....	Avium.....	1888	" 28	" 19	.15	10	10	9
Downer.....	Avium.....	1888	" 29	July 3	.14	7	10	7
Dyehouse.....	Morello.....	1891	" 30	June 20	.11	10	5	10
Eagle (Black).....	Avium.....	1888	" 29	" 28	.15	8	10	9-10
Early Purple.....	Avium.....	1892	" 28	" 8	.16	6	8	8
Elton.....	Avium.....	1892	" 29	" 17	.17	7	8-9	7-8
Esperen.....	Morello.....	1892	" 29	" 28	.16	6	5-6	10
Eugenie.....	Duke.....	1888	" 29	" 23	.14	5	8	9
Everbearing.....	Duke.....	1892	" 29	July 1	.14	4	6	7
Florence.....	Avium.....	1892	" 29	June 26	.09	6	6	9
Frauentorfer.....	Morello.....	1888	" 29	" 30	.11	10	6-7	10
Galopin.....	Duke.....	1891	" 29	July 3	.16	1	7	8
George Glass.....	Morello.....	1888	" 30	June 30	.16	8	8	10
German.....	Avium.....	1896	" 28	" 28	.15	10	5	10
Griotte du Nord.....	Morello.....	1888	May 1	July 12	.14	5	5	10
Hortense.....	Duke.....	1888	April 29	June 24	.17	7	9	8
Ida.....	Avium.....	1893	" 28	" 15	.20	10	8	9
King Morello.....	Morello.....	1891	" 29	" 28	.14	8	7	9
Knight Early.....	Avium.....	1891	" 29	" 26	.16	1	9	9
La Maurie.....	Avium.....	1893	" 28	" 10	.11	5	6	7
Lancaster.....	Morello.....	1894	" 29	" 26	.10	6	6	10
Late Duke.....	Duke.....	1890	" 30	" 30	.18	3	7	7
Lithauer.....	Morello.....	1892	May 1	July 12	.07	10	4-5	10
Magnifique.....	Duke.....	1888	" 1	" 18	.17	10	7	9
Mary Kirtland.....	Avium.....	1891	April 29	June 17	.19	10	9	8
May Duke.....	Duke.....	1888	" 29	" 24	.12	1	8	8-9
Mednyansky.....	Avium.....	1894	" 28	" 29	.21	6	8-9	10
Mezel.....	Avium.....	1891	" 28	" 23	.17	8	9	9
Minnesota (Ostheim).....	Morello.....	1892	May 1	July 1	.11	8	6	9-10
Monarch.....	Morello.....	1886	" 1	June 26	.07	-----	6-7	-----

## TABULATION OF CHERRIES, 1899.—Concluded.

Name.	Species.	Planted.	Bloomed.	Ripened.	Weight of berry in ounces.	Productiveness.— scale 1-10.	Quality.—Scale 1-10.	Vigor.—Scale 1-10.
Montmorency.....	Morello.....	1888	April 29	" 30	.12	10	6	8
Montruell.....	Duke.....	1890	" 29	July 1	.15	8	8-9	9-10
Napoleon.....	Avium.....	1892	" 28	June 30	.24	10	6	9
Northwest.....	Morello.....	1893	May 1	July 3	.10	10	4	8
Ohio (Beauty).....	Avium.....	1891	April 29	June 17	.17	1	6-7	8
Olivet.....	Duke.....	1891	" 29	" 26	.14	7	7	9
Orel 25.....	Morello.....	1893	" 30	July 12	.15	1	8	10
Orel 27.....	Morello.....	1893	" 30	" 26	.19	2	5	10
Osthelm.....	Morello.....	1893	" 29	June 29	.07	10	4	9
Ostheimer.....	Morello.....	1893	" 29	" 30	.10	10	3-4	10
Philippe (Louis).....	Morello.....	1888	" 29	" 26	.11	8	8	9
Plymouth Rock.....	Avium.....	1896	" 29	" 29	.17	1	9	9
Purly.....	Avium.....	1893	" 29	" 24	.13	1	9	7
Richmond.....	Morello.....	1893	" 29	" 24	.11	10	5	10
Rockport.....	Avium.....	1891	" 29	" 17	.16	10	8	8-9
Royal Duke.....	Duke.....	1891	May 1	June 26	.14	3	7-8	7
Rupp.....	Duke.....	1894	April 29	" 26	.17	1	9	8-9
Schmidt.....	Avium.....	1894	" 29	" 29	.22	1	7	10
Skianka.....	Morello.....	1895	" 29	" 23	.11	10	5	10
Spanish (Yellow).....	Avium.....	1891	" 29	" 28	.22	9	10	9
Spate Morello.....	Morello.....	1888	May 1	July 1	.11	10	5-6	7
Strauss.....	Morello.....	1888	April 29	June 28	.11	5	5-6	10
Suda.....	Morello.....	1893	May 1	July 12	.12	10	3-4	10
Tartarian (Black).....	Avium.....	1893	April 28	June 20	.17	9	10	9
Ulatis (Cal. Adv.).....	Avium.....	1893	" 28	" 12	.15	3	8	10
Weir 2.....	Morello.....	1893	" 29	" 26	.15	10	7	8
Windsor.....	Avium.....	1891	" 29	July 3	.20	10	7	9
Wood (Gov.).....	Avium.....	1891	" 29	June 15	.17	10	8	9
Wragg.....	Morello.....	1892	May 1	July 12	.12	8-9	4-5	8-9

## PEACHES.

Although most kinds of fruit at the sub-station stood the severe test of last winter remarkably well, the damage to peaches was considerable. Out of 225 varieties on trial, 40 were lost as a result of the freeze. With but few exceptions the wood of surviving varieties was more or less discolored and many (in the case of some varieties all) of the fruit buds were killed. However, 47 varieties proved sufficiently hardy to mature some fruit and these kinds have been incorporated in the tabulation given.

It is but fair to say that the extent of the injury at the station should not be taken as an indication of the damage sustained by peaches generally throughout this section. In most of the orchards about South Haven, but few if any trees were killed and in many instances fair crops of fruit were harvested. This difference in favor of the commercial orchards may doubtless be attributed largely to their greater elevation, the station grounds being located immediately on the lake shore, at an altitude considerably less than that of most of the neighboring country. But the fact that the station orchards contained such a large number of varieties should also be taken into consideration. Among so many kinds quite a proportion naturally proved much less hardy than many

of the well tested commercial varieties largely planted throughout this section.

With the exception of a few varieties which showed but little discoloration in wood, and a number included in a pruning experiment mentioned later, the trees were cut back to wood from one-half to three-fourths of an inch in diameter. This severe pruning was for the purpose of removing injured wood, lowering the tops in the case of some of the older trees, and stimulating a more vigorous growth, thus aiding in the repair of winter injuries. The trees were apparently benefited by this treatment. They made a good growth, yet ripened their wood well, and this fall are in good condition for winter.

Among the varieties which made the best showing this season were Alexander, Brunson, Brown, Gold Drop, Lewis, Longhurst and Willett. Brown is an early white fleshed peach resembling Lewis. It is fully as hardy as that popular variety and this season was more productive. Longhurst is a new variety which ripened in late September. It is a large yellow peach of the Chili type and proved one of the best varieties which fruited this season. Willett is a yellow freestone of good size and good quality. Ripened September 25.

#### EXPERIMENT IN PRUNING.

The question of when and how much to prune frost injured trees was one frequently asked by fruit growers after the freeze. In order to study the effect of pruning at different times and to varying degrees and to gain, if possible, some new light on the subject an experiment was undertaken. Eight rows of twelve trees each were chosen for the test in a block of ten year-old trees. These rows included forty-eight varieties most of which were considerably injured. The pruning was done at intervals of ten days between April 1 and May 1, two rows being pruned at a time. The manner of pruning was the same in the case of each lot of trees pruned. The first two trees in each row were cut back on wood from one and one-half to two inches in diameter; the next two were pruned a little less severely, and so on gradually lessening the amount of wood removed until the last four trees in the row were reached. These four were pruned in the ordinary way by thinning out and heading in a part of the growth of the year before. On May 1, when the last pruning was done, trees on which the fruit buds had not been entirely destroyed were in blossom and the leaf buds were beginning to open.

As the growing season advanced no variation could be discerned that could be ascribed to difference in time of pruning. But there was an appreciable contrast between trees pruned to different degrees. Among those cut back on wood from one to two inches in diameter, twenty-one or about one-third of the whole number thus severely pruned either failed to start, or sent out, but a few weak shoots which soon withered and died. Of the trees pruned in the ordinary way none were lost, although a few died back to a slight extent. They started a little earlier in the spring than did the trees severely pruned, and during the season made very fair growth. Most of the severely pruned trees which survived, although belated in starting, sent out strong and vigorous new shoots. On a part of these trees the new growth was well distributed and symmetrical new tops were formed while in the case of others only a few

scattered shoots sprang from stumps of the large branches left in pruning. Trees headed in on wood from about half or three-quarters of an inch in diameter as were a part of those included in the experiment and nearly all others on the grounds with but few exceptions survived and made a good development of new wood.

To summarize briefly, difference in time of pruning made no appreciable difference in results. Very severe pruning or removing all the tops down to the stumps of main branches proved dangerous to the life of the trees. More moderate pruning or cutting back on branches from one-half to three-fourths of an inch in diameter gave good results. Trees pruned in the ordinary way were not, at the close of the season, in quite so good condition as those pruned more severely. These results are not considered conclusive. Further differences in the behavior of trees differently treated may yet be detected, as the observations have extended over only one season.

#### EXPERIMENTS IN SPRAYING.

For the purpose of further testing the best methods of combatting leaf curl, which is one of the most serious fungous diseases of the peach in Michigan, experiments with Bordeaux mixture and copper sulphate solution were undertaken. About the middle of March, part of the trees included in the experiment were sprayed with copper sulphate, one pound to twenty gallons of water. On April 20, at which time the buds were beginning to show some color, but before any had actually opened other trees, nearly all of the same varieties as those sprayed in March, were given an application of the same solution used at the same strength. At the same time some of the trees first sprayed were given a second application. After the fruit had set, a row of trees sprayed early and another sprayed late were again sprayed. For this application Bordeaux mixture consisting of four pounds copper sulphate, four pounds of lime, and forty gallons of water, was used.

The season proving unfavorable for leaf curl, but few varieties were badly affected, no matter what the treatment had been. However, the disease appeared sufficiently to show a marked difference between early and late sprayed trees. Trees sprayed in April just before the opening of the buds showed a much larger per cent of curled leaves than those sprayed in March. The second application of copper sulphate to early sprayed trees made no appreciable difference in the amount of curl, and the same was true of Bordeaux mixture applied after the fruit had set. These results accord very nearly with those obtained by somewhat similar experiments carried on here each spring for a number of years past. In a general way it may be said that thorough spraying with copper sulphate solution in March, while the buds are dormant is, under most conditions, an effectual remedy for leaf-curl.

## TABULATION OF PEACHES, 1889.

ABBREVIATIONS: Form—c, compressed; o, oblate; ov, oval; r, round. Color—c, creamy; g, green; r, red; w, white; y, yellow. Adhesion—c, clinging; f, free; s, semi-cling. Quality—1 to 10—1, very poor; 10, best. Flowers—l, large; s, small. Glands—g, globose; r, reniform; s, serrate.

Name.	Planted.	Bloomed.		Glands.	Ripened.	Adhesion.	Weight of specimen in ounces.	Productiveness—Scale 1-10.	Color.			Quality—Scale 1-10.
		Date.	Size.						Form.	Skin.	Flesh.	
Albright.....	1890	May 1	s	g	Oct. 9	f	4.25	1	r	cw	cwr	5-6
Alexander.....	1892	" 1	l	g	July 27	o	4.9	4	ro	r	gw	4-5
Barber.....	1893	" 1	l	r	Sept. 25	f	3.6	1	rov	yr	y	7
Bishop.....	1890	" 1	s	g	Aug. 26	f	5.1	1	r	cwr	w	8
Boyle.....	1890	" 2	s	g	Sept. 8	f	5.55	1	rov	yr	y	7
Brunson.....	1894	" 1	s	r	Sept. 19	f	3.8	4	rov	y	y	6
Brown.....	1892	April 30	l	r	Aug. 21	f	5.85	7	r	yr	w	5-6
Canada.....	1892	May 1	l	g	" 26	s	5	1	r	gr	w	4-5
Champion (Ohio).....	1894	" 1	s	g	Sept. 1	f	8.8	2	r	cwr	w	9-10
Champion (Michigan).....	1890	" 1	l	r	Aug. 25	c	8.35	1	ro	gwr	w	5
Corner.....	1890	" 1	s	r	Sept. 20	f	4	1	rov	yr	y	6
Crosby.....	1892	" 1	s	r	" 19	f	4.5	3	r	yr	y	7
Crothers.....	1890	" 1	s	g	" 23	f	5	1	rov	wr	w	6-7
Early Michigan 15.....	1894	" 2	l	g	" 2	f	4.85	1	r	cwr	cwr	6
Early Michigan 16.....	1894	" 1	l	r	" 5	f	6.2	1	r	cwr	wr	9-10
Engle (Mammoth).....	1892	" 1	s	g	" 8	f	6.18	1	r	yr	yr	9-10
Ford 1.....	1894	" 1	l	r	Aug. 24	s	5.85	1	r	cwr	cwr	6
Gold Drop.....	1890	" 1	l	r	Oct. 6	f	3.2	4	rov	yr	y	7-8
Haas.....	1890	" 1	l	r	Aug. 17	f	5	2	r	wr	w	6
Infant Wonder.....	1892	" 1	s	g	Sept. 8	f	4.95	1	rov	wr	cwr	3
June Rose.....	1894	" 1	l	g	" 8	f	4.25	1	rov	wr	wr	7
Kallola.....	1892	" 1	l	r	" 25	f	5	1	rov	ow	wr	3-4
Lemon Free.....	1894	" 1	l	r	Oct. 9	f	4.9	1	rov	gy	y	4
Lewis.....	1890	" 1	l	r	Aug. 22	f	5.2	5	ro	cwr	cwr	6-7
Longhurst.....	1894	" 1	l	g	Sept. 25	f	5	8	ov	yr	yr	7
Magdala.....	1890	" 1	s	r	" 2	f	4.9	4	r	cwr	cwr	8-9
Marshall.....	1890	" 1	s	r	Oct. 9	f	3.8	1	rov	yr	yr	5-6
Oriole.....	1894	" 1	l	r	Sept. 25	c	5.5	1	ov	y	yr	4-5
Pallas.....	1894	" 1	l	g	" 8	f	5.5	4	rov	wr	cwr	6-7
Pickett.....	1890	" 1	s	r	Oct. 9	c	3	1	ro	yr	y	5-6
Red Seedling.....	1893	" 1	l	g	Aug. 26	s	4.8	1	r	wr	w	6
Reed.....	1890	" 2	s	g	Sept. 8	f	5.25	1	rov	yr	y	7-8
River Bank.....	1892	" 2	l	g	July 26	s	5	1	r	gr	gw	5
Rivers.....	1893	" 1	l	r	Aug. 10	f	6.75	1	ro	cwr	ow	6-8
Salway.....	1890	" 1	s	r	Oct. 9	f	4.3	2	r	yr	yr	6-7
Scott.....	1890	" 1	s	g	" 5	f	2.8	2	rov	yr	y	7
Snow Late.....	1890	" 1	s	r	Sept. 8	f	3.5	1	rov	yr	y	7
Southern Early.....	1890	" 1	s	r	" 8	f	4.5	1	r	yr	yr	7-8
Spottswood.....	1894	" 3	l	r	" 25	f	4.5	1	rov	w	wr	6-7
Stevens Late.....	1890	" 1	s	r	" 8	f	3.9	1	r	cwr	wr	5-6
Strong (Mammoth).....	1892	" 1	s	g	" 25	f	4	1	r	cwr	wr	5-6
Summer Snow.....	1894	" 1	l	g	Oct. 2	c	2.5	10	r	ow	ow	4
Toquin.....	1892	" 2	l	r	Sept. 20	f	3	1	r	yr	yr	7
Triumph.....	1896	" 1	l	g	Aug. 9	s	3	1	r	yr	y	7-8
Troth.....	1890	" 1	s	g	" 27	f	3.85	2	r	cwr	wr	8
Willett.....	1894	" 1	l	r	Sept. 25	f	4	7	ro	yr	yr	6
Worthen.....	1890	" 1	s	r	" 8	f	6.6	1	rov	yr	yr	8

## PEARS.

Late in March, pear trees, with the exception of a few rows, were sprayed with copper sulphate, one pound to fifteen gallons of water. On May 1 the trees omitted in the first spraying were given an application of Bordeaux mixture. The object of this variation in treatment was to test

the relative value of spraying with copper sulphate solution while the buds are dormant and spraying with Bordeaux mixture just as the buds are about to open. No difference could be detected in favor of either line of treatment during the season. After the fruit had set the trees were again sprayed, Bordeaux mixture and Paris green being used. Neither insects nor fungi proved troublesome during the season. Nearly all varieties of bearing age yielded some fruit and in the case of quite a number of kinds the yield amounted to a good crop.

On August 4, and again two weeks later, one tree each of Bartlett and Clapps Favorite was sprayed with liver of sulphur (one ounce to four gallons of water), to see if the color of the fruit could be heightened by the use of this solution. Trees of the same varieties were left untreated to serve as checks. Some of the fruit was also dipped in the solution at intervals of two or three days for about three weeks. When the fruit had ripened, that of sprayed trees and specimens dipped were compared with fruit untreated. No difference in color which could be attributed to the use of liver of sulphur was detected.

The following varieties fruited here this season for the first time:

**Bartlett Seckel.**—Fruit small to medium, oblong pyriform; cavity none; stalk one inch long, slender; basin shallow, slightly corrugated; calyx open, lobes erect; color light yellow with handsome red cheek; flesh white, melting, slightly granular; quality very good; season first to middle of October. The tree is an upright, vigorous grower with stout reddish brown shoots.

**Hardy.**—Medium size, obovate, with a slight cavity and a stalk about one inch long; basin shallow, regular; calyx open, lobes upright, reflexed at tips; calyx tube cup-shaped; flesh white, juicy, buttery, melting, fine grained; season late September and early October; quality very good. The trees which have been planted eleven years are upright and vigorous in growth.

**Longworth.**—Trees upright, vigorous with dull yellowish shoots. Fruit medium, obovate turbinate; stalk one inch long, moderately stout; basin broad, shallow; calyx open or partly open; color light waxen yellow, sprinkled with small russet dots; flesh white, lacking in juice, firm, breaking coarse and granular; flavor sweet, highly perfumed; quality poor; season middle of September. Does not appear to be of value here.

**Superfin.**—An old French variety valued as a dessert sort. Fruit large, roundish, inclined to pyriform; stalk one and one-half inches long, curved; calyx open, segments recurved; cavity none; basin deep, rather abrupt; color greenish-yellow, slightly russeted and thickly dotted with small gray dots; flesh white, very juicy, melting fine grained; quality very good; season October. Tree upright with a compact head; young wood yellowish-brown with prominent buds.

**Wilder.**—Tree upright, vigorous, rather a tardy bearer here. Fruit medium to large, obtuse pyriform to obovate, stalk one inch long, rather stout, set in a narrow, russeted cavity; basin broad plaited; calyx closed, lobes enlarged and fleshy at base; color greenish-yellow with light red cheek in exposed specimens; flesh white, tender, half fine, rather dry; quality rather low; season middle of August. If productive, this variety may have some value as an early market sort on account of size and good appearance.

TABULATION OF PEARS, 1889.

ABBREVIATIONS: Season, months—b, beginning; e, end; m, middle. Form—e, elongated; i, irregular; o, oblong; obo, obovate; obt, obtuse; ov, ovate; p, pyriform; r, round; t, turbinate. Color—b, brown; c, crimson; g, greenish; r, red; ru, russet; w, whitish; y, yellow. Texture—b, buttery; f, firm; s, granular; m, melting; t, tender; br, breaking. Flavor—a, acid; m, mild; as, astringent; j, juicy; s, sweet; v, vinous; p, perfumed. Use—d, dessert; k, kitchen; m, market. Origin—Fr, France; Eng, England; Belg, Belgium; Rus, Russia; Eur, Europe.

Name.	Planted.	Bloomed.	Season.	Vigor— Scale 1-10.	Origin.	Product— Scale 1-10.	Weight in ounces.	Form.	Color.		Texture.	Flavor.	Quality— Scale 1-10.	Use.
									Skin.	Flesh.				
Angouleme.....	1891	April 29	Oct., Nov.....	10	France.....	10	10	obo	gy ru	w	b	m v	6-7	m
Anjou.....	1888	May 1	Oct., Nov.....	8	France.....	10	6.45	obt p	gy r	w	m	v p	8-9	d m
Anault.....	1890	"	Sept., Oct.....	8	France.....	2	3.8	obo obt p	y ru	w	t b m	v p	6	m
Berry (P.).....	1892	"	Dec., April.....	8	California.....	8	6.35	e obt	y ru	w	f	s v	8-4	d m
Bartlett.....	1891	"	m Sept.....	8	England.....	10	10	obo obt p	y ru	w	t b	v p	6	d m
Bartlett Seckel.....	1894	"	1 m Oct.....	9	".....	1	3.25	obo p	y r	w	m	s v	8	d
Bloodgood.....	1888	"	m Aug.....	10	New York.....	7	2.3	t obo	y ru	y w	b m	s p	6	d m
Bosc.....	1888	"	Oct.....	10	Belgium.....	3	7.45	p	y ru	w	b m	s p	10	d m
Boussock.....	1891	"	Sept., Oct.....	10	Belgium.....	1	7.45	r obo	y ru	w	b m	s p	7	m
Butum.....	1891	"	Oct., Nov.....	10	Rhode Island.....	1	8.1	obo obo	y r ru	w	t b g	m	6	m
Clapp Favorite.....	1888	"	1 m Aug.....	10	Massachusetts.....	10	9	t	y b ru	w	b m	v	6-7	d m
Comice.....	1891	"	m e Oct.....	10	France.....	10	7	r obt p	g b r	w	b m	j a p	9	d m
Dana Hovey.....	1888	"	Oct., Nov.....	10	Massachusetts.....	4	3.9	obo obt p	y ru	y w	g m	s p	10	d m
Dearborn.....	1891	"	Aug.....	10	Massachusetts.....	6	2.45	t	y ru	w	g m	s f	8	d
Desportes.....	1891	"	Aug.....	10	France.....	2	2.7	p	g r ru	w	m b	s	5	m
Drouard.....	1894	"	Oct., m Nov.....	10	France.....	5	9.6	r obo obt p	y ru	w	t b	s p	5	m
Early Duchess.....	1892	"	m Sept.....	7-8	France.....	4-5	8	obo obt p	y r ru	w	t b m	s	6-7	m
Edmonds.....	1890	"	Sept., Oct.....	10	New York.....	10	3.8	obo obt p	g y	w	b m	v j	5-6	m
Elizabeth (Manning).....	1891	"	e Aug.....	10	Belgium.....	10	3.15	r obo	y ru	w	t m	s	8	d
Esperen.....	1891	"	Oct., Nov.....	10	Belgium.....	1	3.3	r obt p	y ru	w	t m	v	4-5	m
Fitzwater.....	1891	"	Oct.....	10	New York.....	7	7	obo obt p	y ru	w	b m	s	8-9	d m
Flemish.....	1891	"	m Sept.....	10	Belgium.....	3	10	obo obt p	y r ru	w	b m	s j	6-7	d
Fred Clapp.....	1888	"	1 Sept., Oct.....	10	Massachusetts.....	10	8.2	r obo p i	y	w	b m	v	7-8	d m
Giffard.....	1888	"	Aug.....	10	France.....	10	3.8	p	g y r	w	b m	j v p	9	d m
Gray Doyenne.....	1888	"	Sept., Nov.....	10	France.....	7	3.1	ov obo p	ru	y w	b m	rich	8-10	d m
Hardy.....	1888	"	1 Sept., e Oct.....	10	".....	1	4	obo	g y ru	w	b m	v	8	d
Howell.....	1889	"	Sept., Oct.....	8-9	Connecticut.....	10	7.65	r p	y r ru	w	b m	v	5-6	d m
Jones.....	1889	"	Oct., Nov.....	8	Pennsylvania.....	7	2.65	obo p	y r ru	w	g b	s v	5-6	d
Kieffer.....	1891	"	Oct., m Nov.....	10	Pennsylvania.....	6	5.1	r obo obt p	y r ru	w	g m	s p v	3-4	m
Kennedy.....	1891	"	Sept.....	10	Kentucky.....	1	2.4	t obo	y ru	w	m g	m	3-4	?
Lawrence.....	1888	"	Oct., Dec.....	8	New York.....	4	5.25	obo obt p	y ru	w	g b	s p	8-9	d m
Lawson.....	1889	"	m Aug.....	10	New York.....	2	5.2	obo p	y r	w	g b	s	3-4	m
Longworth.....	1891	"	m Sept.....	10	Ohio.....	5	4.5	obo t	y ru	w	br g	s p	5	m

Lucrative.....	1888	"	1	m Sept.	10	Europe.....	10	4.6	obo p	gy	w	m	s	8.9	d m
Marquette.....	1889	"	1	Aug.	9	France.....	9	5	obt p	yg	w	t b	v	8	d
Marshall.....	1893	"	1	Oct.	10	New York.....	10	5.9	obo	gy ru	w	br	v	4.5	m;
Millett.....	1891	"	1	Dec. May	8	Europe.....	8	10	obt p	gy ru	w	f b	v	5.6	k
Mount Vernon.....	1894	"	1	Oct. Nov.	10	Massachusetts.....	10	8	ro v obt p	y ru	w	t b m	j v p	7.8	k m
Ogereau.....	1891	April 29	1	Oct. Nov.	8	Europe?	8	5.9	obo ob p	y ru	w	b	v	6.7	m
Onondaga.....	1891	May	1	Oct. Nov.	10	Connecticut?	10	8.88	obo ob p	y ru	w	b m	v p	7	m
Plimaston.....	1891	"	1	Sept. Oct.	10	England.....	10	12.6	obo ob p	y ru	y w	b m	v	7.8	m
Reeder.....	1891	"	1	Oct. b Nov.	9	New York.....	9	4.5	robt p	y ru	w	b m	v	7.8	d m
Rostlezer.....	1888	"	1	m Aug. m Sept.	10	Europe.....	10	7	obo p	y b ru	w	m b	s v p	10	d
Rutter.....	1892	"	1	Oct.	10	Pennsylvania.....	10	8	r p	y g ru	w	b m	s v	7	m
Seckel.....	1888	"	1	Oct.	10	Pennsylvania.....	10	3.6	obo	y b r	w	b m	s v	10	d
Sheldon.....	1890	"	1	Oct.	10	New York.....	10	6.8	robt obo	y b ru	w	m	s v p	7.8	m d
Souvenir.....	1890	"	1	m Sept.	10	France.....	10	7.5	robt p	y r	w	b m	j p	5.4	m
Sterling.....	1888	"	1	Aug.	10	New York.....	10	4.15	r t	y ru r	w	m	s	5.6	m
Summer Doyenne.....	1888	"	1	Aug.	10	Belgium.....	10	1.5	r obo	y b	w	t b m	s v p	5	d
Superfin.....	1891	"	1	Oct.	10	France.....	10	6.5	r p	gy ru	w	m	v	7.4	d
Victor.....	1891	"	1	Oct.	10	Pennsylvania.....	10	2.9	robt p	y	w	t b m	s p	7.8	d m
Wilder.....	1889	"	1	m Aug.	10	New York.....	10	4.5	obo p	y r	w	t	m	4	d m
Winter Nells.....	1888	"	4	Oct. m Jan.	10	Belgium.....	10	2.95	obo	y ru	w	t b m	s p	10	d m
Zache.....	1894	"	4	Nov. April.	10	.....	10	6	r o	y ru	w	g	s	2.3	?



TABULATION OF PEARS, 1889.

ABBREVIATIONS: Season, months—b, beginning; e, end; m, middle. Form—e, elongated; i, irregular; o, oblate; ob, oblong; obo, obovate; obt, obtuse; ov, ovate; p, pyriform; r, round; t, turbinate. Color—b, brown; c, crimson; g, greenish; r, red; ru, russet; w, whitish; y, yellow. Texture—b, buttery; f, firm; g, granular; m, melting; t, tender; br, breaking. Flavor—a, acid; m, mild; as, astringent; j, juicy; s, sweet; v, vinous; p, perfumed. Use—d, dessert; k, kitchen; m, market. Origin—Fr, France; Eng, England; Belg, Belgium; Rus, Russia; Eur, Europe.

Name.	Planted.	Bloomed.	Season.	Vigor— Scale 1-10.	Origin.	Product— Scale 1-10.	Weight in ounces.	Form.	Color.		Texture.	Flavor.	Quality— Scale 1-10.	Use.
									Skin.	Flesh.				
Angouleme.....	1891	April 29	Oct., Nov.....	10	France.....	10	10	ob obo	gy ru	w	b	m v	6-7	m
Anjou.....	1888	May 1	Oct., Nov.....	8	France.....	1	6.45	obt p	gy ru	w	m	v p	8-9	d m
Ansault.....	1889	" 1	Sept. e Oct.....	8	France.....	2	3.8	obo obt p	gy ru	w	t b m	p	6	m
Barry (P.).....	1892	" 1	Dec., April.....	8	California.....	8	6.35	e obt p	gy ru	w	f	v	3-4	d m
Bartlett.....	1891	" 1	m Sept.....	8	England.....	10	10	obo obt p	gy ru	w	t b	v p	6	d m
Bartlett Seckel.....	1894	" 1	m Oct.....	9	".....	1	3.25	obt p	yr	w	m	s v	8	d
Bloodgood.....	1888	" 1	m Aug.....	10	New York.....	7	2.3	t obo	yr ru	y w	b m	s p	6	d m
Bosc.....	1888	" 1	m Oct.....	10	Belgium.....	3	7	p	yr ru	w	b m	p j	10	d m
Boussock.....	1891	" 1	Sept., Oct.....	10	Belgium.....	1	7.45	r obo	yr ru	w	b m	s j p	7	m
Buttum.....	1891	" 1	Oct., Nov.....	10	Rhode Island.....	1	3.1	ob obo	yr ru	w	t b g	m	6	m
Clapp Favorite.....	1888	" 1	m Aug.....	10	Massachusetts.....	10	9	t	y br	w	b m	v	6-7	d m
Comice.....	1891	" 1	m e Oct.....	10	France.....	10	7	r obt p	gy ru	y w	b m	s p	9	d m
Dana Hovey.....	1888	" 1	Oct., Nov.....	10	Massachusetts.....	4	8.9	obo obt p	gy ru	y w	g m	s j	10	d m
Dearborn.....	1891	" 1	Aug.....	10	Massachusetts.....	2	2.45	t	y	w	m b	m	8	d
Desportes.....	1891	" 1	Aug.....	10	France.....	2	2.7	p	gy ru	w	m	j m	5	m
Drouard.....	1894	" 1	Oct. m Nov.....	10	France?.....	5	9.6	r obo obt p	yr ru	w	t b	s p	5	m
Early Duchess.....	1892	" 1	m Sept.....	7-8	France.....	4-5	8	obo obt p	yr ru	w	t b m	v j	6-7	m
Edmonds.....	1889	" 1	Sept., Oct.....	10	New York.....	10	3.8	obo obt p	gy	w	b m	s	6-6	m
Elizabeth (Manning).....	1891	" 1	e Aug.....	10	Belgium.....	10	3.15	r obo	yr ru	w	t m	s p	8	d
Epiphen.....	1891	" 1	Oct., Nov.....	10	Belgium.....	1	3.3	r obt p	yr ru	w	t m	v	4-5	m
Fitzwater.....	1891	" 1	Oct.....	10	New York.....	7	7	obo obt p	yr ru	w	b m	s	8-9	d m
Flemish.....	1891	" 1	m Sept.....	10	Belgium.....	3	10	obo obt p	yr ru	w	b m	s j	6-7	d
Fred Clapp.....	1888	" 1	1 Sept. Oct.....	10	Massachusetts.....	10	8.2	r obo p 1	y	w	b m	v	7-8	d m
Giffard.....	1888	" 1	Aug.....	10	France.....	10	3.8	p	gy r	y w	b m	j v p	8-10	d
Gray Doyenne.....	1888	" 1	Sept., Nov.....	10	France.....	7	3.1	ov obo p	ru	y w	b m	rich	9	d
Hardy.....	1888	" 1	1 Sept. e Oct.....	10	".....	1	4	obo	gy ru	w	b m	v	8	d
Howell.....	1889	" 1	Sept. Oct.....	8-9	Connecticut.....	10	7.65	r p	yr ru	w	b m	v	5-6	d
Jones.....	1889	" 1	Oct., Nov.....	8	Pennsylvania.....	7	2.65	obo p	yr ru	w	g b	s v	6-6	d
Kiefer.....	1891	" 1	Oct. m Nov.....	10	Pennsylvania.....	6	5.1	r obo obt p	yr ru	w	g m	s p v	3-4	m
Kentuck.....	1891	" 1	Sept.....	10	Kentucky?.....	1	2.4	t obo	yr ru	w	m g	m	3-4	?
Lawrence.....	1888	" 1	Oct., Dec.....	8	New York.....	1	5.25	obo obt p	yr ru	w	m g	s p	8-9	d m
Lawson.....	1889	" 1	m Aug.....	10	New York.....	2	5.2	obo p	yr	w	g b	s	2-4	m
Longworth.....	1891	" 1	m Sept.....	10	Ohio.....	5	4.5	obo t	yr ru	w	br g	s p	5	m

Lucrative.....	1898	"	"	m Sept.	10	Europe.....	10	4.6	obo p	gy	w	m	s	8-9	d m
Marguerite.....	1899	"	"	Aug.	9	France.....	9	5	obt p	y g	w	t b	v	8	d
Marshall.....	1900	"	"	Oct.	18	New York.....	18	5.9	obo	yru	w	or	m	4-5	m
Millett.....	1901	"	"	Dec., May	10	Europe.....	10	8	obp!	gyru	w	t b	v	5-8	k
Mount Vernon.....	1904	"	"	Oct., Nov.	10	Massachusetts.....	8	4	rov obt p	yru	w	t b	j v p	7-8	k m
Ogereau.....	1901	April 29	"	Oct., Nov.	8	Europe?	8	5.9	obo obt p	yru	w	b	v	6-7	m
Ondaga.....	1901	May	"	Oct., Nov.	10	Connecticut?	10	8.88	obo o p	yru	w	b m	v p	7-8	m
Plumaston.....	1901	"	"	Sept., Oct.	10	England.....	2	12.6	ob obt p	yru	yw	b m	v	7-8	m
Reeder.....	1901	"	"	Oct. b Nov.	9	New York.....	1	1.6	robt p	yru	w	b m	v	7-8	d m
Rostler.....	1898	"	"	m Aug. m Sept.	10	Europe.....	7	2.4	obo p	yru	w	m b	s v p	10	d
Rutter.....	1902	"	"	Oct.	10	Pennsylvania.....	8	8	r p	yru	w	b m	s v	7	m
Seckel.....	1898	"	"	Oct.	10	Pennsylvania.....	6	3.4	obo	yru	w	b m	s v	10	d
Shelden.....	1900	"	"	Oct.	10	New York.....	1	6.8	robt obo	yru	w	m	s v p	7-8	m d
Soultair.....	1900	"	"	m Sept.	10	France.....	1	7.8	robt p	yru	w	b m	j p	5-8	m
Sterling.....	1898	"	"	Aug.	10	New York.....	7	4.15	r t	yru	w	m	s	5-6	m
Summer Doyenne.....	1898	"	"	Aug.	10	Belgium.....	6	1.5	r obo	yru	w	t b m	s v p	5	d
Superfin.....	1901	"	"	Oct.	10	France.....	1	6.5	r p	yru	w	m	v	7-8	d
Victor.....	1901	"	"	Oct.	10	New York.....	1	2.9	robt p	yru	w	t b m	s p	7-8	d m
Wilder.....	1899	"	"	m Aug.	10	New York.....	1	4.5	obo	yru	w	t	m	4	m
Winter Nells.....	1898	"	"	Oct. m Jan	10	Belgium.....	5	2.96	obo	yru	w	t b m	s p	10	d m
Zache.....	1894	"	"	Nov. April.	10	Belgium.....	4	6	r o	yru	w	g	s	2-3	t

## QUINCES.

Quinces were sprayed with copper sulphate solution, one pound to fifteen gallons of water, in early spring and with Bordeaux mixture when the fruit had set. All varieties escaped winter injury, except the Hong Kong which was killed. This variety was planted here in 1888, and never either bloomed or fruited. Most kinds of bearing age produced full crops.

Alaska is both vigorous and productive. Fruit roundish, slightly oblate, ribbed; basin broad, rather deep; cavity none; calyx nearly closed, segments long, reflexed; color golden yellow; flesh pale yellow, crisp. Not so large as the Orange, but in other respects it seems equal to that variety.

Meech bore a very full crop this season. The fruit is below medium in size, roundish, slightly oblate; basin narrow, deep, ribbed; calyx nearly closed, segments short; cavity very slight, ribbed; flesh pale yellow, firm, crisp. Very symmetrical in form.

Missouri is the largest variety on trial. Form roundish, somewhat irregular; basin broad, deep, ribbed; calyx open, segments long, leaf-like, reflexed; color rich yellow; quality very good. Season October and November.

Rea is of good appearance and large size. Form roundish oblate, ribbed; basin broad, rather deep; calyx closed, tips of segments reflexed; color golden yellow. A seedling of the Orange.

TABULATION OF QUINCES, 1899.

Name.	Planted.	Bloomed.	Ripe.
Alaska.....	1891	May 15.....	Middle of October.
Angers.....	1890		
Bourgeat.....	1895		
Champion.....	1888	May 14.....	
Fuller.....	1891	May 17.....	
Hong Kong.....	1888		
Meech.....	1888	May 16.....	Middle of October.
Missouri.....	1890	May 12.....	Middle of October.
Rea.....	1888	May 12.....	Early October.
Van Deman.....	1895	May 17.....	Middle of October.

Van Deman first fruited here last year, and this season bore nearly a full crop. Fruit roundish, slightly oblate; basin irregular, ribbed; cavity slight; color clear rich yellow; flesh pale yellow, crisp, firm; quality very good. Season middle of October.

## PLUMS.

American and European plums came through the winter uninjured, except for a few trees of the latter species which were slightly frozen at the tips of new growths. A few of the Japanese varieties were quite badly frozen and in the case of a number of sorts a large per cent of the fruit buds were killed. Injuries to varieties of this species are mentioned on another page under notes on Japanese plums.

In addition to the use of copper sulphate solution early in the spring and Bordeaux mixture after the fruit had set, a number of varieties were sprayed from two to four times during the summer for the purpose of checking the brown rot, if possible. In the case of some varieties which were rotting badly one tree of a kind was sprayed and another of the same sort left unsprayed in order that the results of spraying might be more accurately determined. The copper sulphate was first used at the rate of one pound to three hundred gallons of water, but later the strength of the solution was increased, one pound to two hundred gallons, being used. Rains occurred once or twice shortly after applications had been made and as soon afterward as possible the trees were again sprayed. Although the trees were sprayed thoroughly each time and as many as four applications made in the case of some kinds, the treatment made but little if any difference in the amount of rot. Fruit of sprayed trees continued to rot almost if not quite as badly as that of trees unsprayed. Conditions during the latter half of July and the first half of August were unusually favorable for the rot, hot moist weather prevailing most of the time during that period, and this may in part explain the lack of success in attempting to control the disease by spraying.

Shot-hole fungus appeared on a few varieties during the season. Abundance, Burbank, Ogon, Simon and Yosebe, were the kinds most affected. However, in the case of most varieties, spraying served to keep the foliage free from fungous attacks and the leaves held on well until fall.

In June a number of heavily loaded trees of several varieties were thinned, while other trees of the same kinds were left unthinned to serve as checks on results. Some varieties were thinned more severely than others in order that the effects of both ordinary and severe thinning might be observed. Records were kept of the kind of thinning, number of pounds of fruit removed in the case of each tree thinned, size of fruit at time of thinning, length of time required to thin, etc. It was expected that full notes of a similar nature would be taken when the fruit had ripened, but owing to the prevalence of rot this could not be done in the case of all varieties. A detailed account of the experiment is therefore omitted. However, in a general way it may be said that thinning in nearly every instance gave increased size of fruit. It was also observed that there was less rot on thinned than on unthinned trees.

#### EUROPEAN PLUMS.

Among the more productive of the European varieties were Archduke, Diamond, Grand Duke, Lombard, Middleburg and Victoria. The following are varieties which were not included in the report of last year:

**Baker Damson.** Trees very upright, vigorous. Fruit small, roundish ovate with a slight cavity and slender stem; apex marked by a small dot; color black; flesh greenish amber, juicy; fruit small, roundish, cling; quality good. Very good for culinary purposes, but as yet quite unproductive.

**Early Red.**—This variety was received from Prof. Budd of Iowa as Black Prune, but is probably Early Red according to Prof. Budd's description of that variety, while Nicholas, another of Prof. Budd's importations from eastern Europe also turns out to be Early Red. The trees of Early Red are upright, slightly spreading, weak, thin growers.

Fruit resembles Lombard quite strongly in appearance, but ripens at least two weeks earlier than that variety. Form oval; stalk three-fourths of an inch long, set in a slight cavity; suture rather obscure; bloom blue, slight; color purplish red; flesh firm, juicy, greenish yellow; flavor sub-acid pleasant; quality good. Not considered promising.

Engle.—Fruit roundish oval; stalk rather short and stout, set in a narrow shallow cavity; suture somewhat obscure, half around; color yellow with faint traces of green; flesh firm, fine grained, yellow; pit oval, pointed, free; flavor sweet rich; quality good. A good dessert variety which this season ripened August 2. The trees are vigorous, upright, slightly spreading.

G. No. 4.—Received from New York State in 1890, under letter and number given. Trees upright with roundish slightly spreading heads. Fruit nearly round; stem about three-fourths of an inch long, slender, set in a narrow rather deep cavity; suture broad, shallow; color very dark purple with numerous light specks; bloom blue, plentiful; pit nearly round, cling; flesh very firm, juicy, tender, pale amber; quality good. A poor bearer and seems to be of little value here.

White Queen.—Received through the Division of Pomology in 1890, and fruited here this season for the first time. The trees are upright, slightly spreading, vigorous. Fruit roundish ovate, slightly flattened at the base; stem about one inch long, curved, set in a slight, regular cavity; suture, a line half around; apex, a dot in a slight depression; color yellowish white, mottled and overlaid with light purple becoming dark in exposed specimens; bloom heavy, whitish; flesh yellow, juicy, tender; pit small, plump, oval, cling; quality best. Ripe September 9.

#### JAPANESE PLUMS.

Burbank was uninjured in wood, but about twenty-five per cent of the fruit buds were winter killed. However, this variety sets so many buds that in spite of the large number destroyed, the trees set too much fruit and required thinning.

Berckmans bore some fruit on grafts set in 1897. The fruit is roundish to roundish oblong; stalk three-fourths of an inch long, very stout, set in a broad shallow cavity; suture well marked, half around; color very dark red with many golden yellow dots; bloom slight, pinkish; flesh tender, juicy, yellowish; pit quite small, oval, cling; quality rather low. The shoots are olive green with many gray dots. Requires further testing.

Hale was badly frozen back and all of the fruit buds were killed. The trees were well cut back in pruning and made a strong growth this season. Kelsey was killed to the ground. This variety is not hardy enough to carry its buds safely through even our ordinary winters, and consequently never matured any fruit here. Normand grafts two years old were killed.

Satsuma which has heretofore been very productive, and apparently quite hardy here, was badly discolored in wood and all except a very few of the fruit buds were killed. Wickson was not injured in wood, but nearly all of the fruit buds were killed and no fruit was borne.

Willard is an upright, spreading, very vigorous grower. Fruit oblong with a stout stalk about three-fourths of an inch long; cavity deep; suture rather obscure; color bright red with light bluish bloom; flesh rather firm, whitish; flavor mild; quality poor.

## TABULATION OF PLUMS, 1899.

ABBREVIATIONS: Form—l, long; o, oval; ob, obovate; r, roundish. Color—b, black; g, greenish; p, purple; r, red; w, whitish; y, yellowish. Adhesion—c, cling; f, free; s, semi-cling.

Name.	Species.	Planted.	Vigor—Scale 1-10.	Bloomed.	Ripened.	Form.	Color.	Adhesion.	Weight of specimen in ounces.	Product—Scale 1-10.	Quality—Scale 1-10.
Abundance.....	Triflora.....	1895	9	April 28	July 29	ro	r	c	1.9	8	7
Agen Prune.....	Domestica.....	1890	10	" 29	Sept. 5	o	pb	f	1.9	6	8
Archduke.....	Domestica.....	1890	10	May 1	Aug. 9	ro	bb	f	1.3	10	7
Arctic.....	Domestica.....	1890	10	April 29	Aug. 17	ro	b	s	.8	10	5
Baker (Damson).....	Domestica.....	1893	10	" 30	Sept. 9	ro	b	s	.4	1	6-7
Bavay.....	Domestica.....	1890	10	" 29	" 23	r	gy	c	1.6	6	10
Berckmans.....	Triflora.....	1897	10	" 29	Aug. 29	r	r	c	1.4	8	4-5
Bradshaw.....	Domestica.....	1890	9	May 1	" 17	o	p	f	1.8	8	6-7
Burbank.....	Triflora.....	1893	10	April 29	" 13	r	r	c	1.9	10	6
Burbank 7.....	Domestica.....	1890	8	" 28	Sept. 1	rob	gy	s	1.55	2	9
Coe.....	Domestica.....	1893	10	" 29	" 23	o	y	c	2.2	2	8
Czar.....	Domestica.....	1892	9	" 29	Aug. 10	ro	p	f	1	5	7
Diamond (Black).....	Domestica.....	1892	10	" 30	Sept. 12	o	b	r	1.8	10	5-6
Early Red.....	Domestica.....	1893	7	" 30	Aug. 21	o	r	c	.96	1	7
Engle.....	Domestica.....	1892	8	" 29	" 2	ro	gy	f	.9	6	8
Field.....	Domestica.....	1892	10	" 29	" 17	r	p	c	1.55	3	7
French Damson.....	Domestica.....	1893	10	May 1	Sept. 19	o	b	c	.6	3	7
G. No. 4.....	Domestica.....	1890	10	" 1	" 8	r	p	c	1.62	2	7
Giant Prune.....	Domestica.....	1895	9	" 1	" 8	o	r	f	2.03	2	7
Grand Duke.....	Domestica.....	1890	10	April 29	" 22	o	b	c	1.6	10	6
Kingston.....	Domestica.....	1890	10	" 28	" 12	o	b	s	1.5	9	6
Lincoln.....	Domestica.....	1890	9	" 30	Aug. 10	ro	rp	f	2.12	9	8-9
Lombard.....	Domestica.....	1899	10	" 29	Sept. 5	r	p	c	1.2	10	6
Long Fruit.....	Triflora.....	1890	10	" 28	July 18	r	r	s	.45	8	4
Lyon.....	Domestica.....	1890	10	May 1	Aug. 19	r	y	f	1.7	2	8
Marianna.....	Cerasifera.....	1890	10	April 29	July 28	ro	r	c	.7	9	8
Maru.....	Triflora.....	1890	8	May 1	Aug. 10	r	r	c	1.4	1	4
Middleburg.....	Domestica.....	1890	10	April 29	Sept. 25	ro	rp	f	1	10	6-7
Monarch.....	Domestica.....	1893	10	" 29	" 25	o	p	f	1.5	6	7
Murphy.....	Domestica.....	1892	9	May 1	" 8	o	rp	f	2.55	8	8
Ogon.....	Triflora.....	1890	10	April 28	July 25	r	y	f	.8	10	2-3
Orel 20.....	Domestica.....	1893	9	May 1	Aug. 13	lo	b	f	.55	1	5
Red June.....	Triflora.....	1890	10	April 28	July 25	ro	r	c	1.1	10	6
Robinson.....	Angustifolia.....	1890	10	May 3	Sept. 2	r	r	c	.75	8	6
Shipper (Pride).....	Domestica.....	1890	10	April 29	" 5	ro	b	s	1.67	5	7
Shropshire (Damson).....	Domestica.....	1890	10	" 30	" 19	ro	b	s	.45	8	6-7
Simon.....	Simonl.....	1893	5	" 28	Aug. 13	r	r	c	1.6	10	2
Spaulding.....	Domestica.....	1890	10	" 29	Sept. 1	o	gy	s	1.35	4	9
Victoria.....	Domestica.....	1890	10	" 29	Aug. 25	o	r	f	1.65	10	8
Wangenheim.....	Domestica.....	1890	10	May 1	" 29	o	b	f	.85	9	7
White Queen.....	Domestica.....	1894	9	" 1	Sept. 9	ro	ywp	c	1.7	1	9
Willard.....	Triflora.....	1894	10	April 29	July 24	o	r	c	1	1	3
Wyant.....	Americana.....	1890	8	May 1	Sept. 11	ro	r	f	.7	4	7
Yellow Aubert.....	Domestica.....	1893	10	" 1	Aug. 28	o	y	c	1.8	3	5
Yellow Egg.....	Domestica.....	1893	10	April 30	" 30	o	y	f	1.8	3	4-5
Yosebe.....	Triflora.....	1890	10	" 28	July 12	r	r	c	.5	8	2-3

## GRAPES.

Results with grapes have been somewhat unsatisfactory this season. This was due to several causes, among which were injury by winter, several varieties being frozen to the ground and others more or less damaged; attack of both downy and powdery mildew, especially the latter; and a hard frost on the night of September 30, which caused the

leaves to fall considerably and prevented some of the late ripening varieties from maturing properly.

Before the buds opened, the vines were sprayed with copper sulphate, one pound to fifteen gallons of water. For the powdery mildew liver of sulphur was used at the rate of three ounces to ten gallons of water. This solution was applied on the first appearance of the disease in early August. Two weeks later, downy mildew appearing also, the plants were again sprayed, copper sulphate being used for this application at the rate of one pound to two hundred and fifty gallons of water. These attacks of mildew were confined principally to hybrids with *V. vinifera*. The vines were quite free from the work of insects.

Adirondac was killed nearly to the ground by the freeze. It has not proven of value here. Black Eagle was also badly killed back, and bore only a few small clusters of fruit. It is a grape of good quality, but lacks vigor, productiveness, and hardiness. Brighton set a fair crop of fruit, but most of it was badly coated with powdery mildew.

Campbell Early is one of the most promising of the new varieties. The vines are vigorous, hardy, and productive. Bunches long, shouldered, moderately compact; berries large, firm, cling to stem well. Ripens with Moore Early, keeps well, and is of good quality.

Delaware and Diamond bore very full crops. Downing and Mills were frozen to the ground. Duchess was quite badly injured and bore but little fruit. Etta yielded a very large crop, but it is too acid and low in quality to be of much value. It is a white grape, borne in large, compact clusters.

Goldstein is a new black variety set in 1897. It proves very vigorous, hardy, and productive, but is of poor quality and shells badly. Guinevra and Josselyn 9, were among the more productive varieties. Guinevra is a large white grape of good quality, borne in medium to large compact clusters. Josselyn 9 is a dark purple grape of rather poor quality. The clusters are long, cylindrical, moderately compact.

Niagara was quite unproductive. The vines were somewhat injured by the winter, but made a strong growth of new wood this season. Pocklington came through the winter uninjured and bore a full crop. Rogers Nos. 24 and 30, and Secretary were killed to the ground. Triumph, which is a southern grape requiring a long season, has usually failed to mature properly here, but this season ripened fairly well. However, the quality of the grape as grown in this section is poor and the bunches although very large and compact were rather unattractive in appearance because of the attack of powdery mildew.

Ulster and Woodruff set too much fruit and, this together with the frost of September 30, prevented the ripening of more than a small part of the crop. Ulster is a red grape of good quality, with its berries in cylindrical compact clusters. Woodruff is also a red grape. The bunches which are sometimes inclined to be small and imperfect were large and compact this season, but the quality was very poor.

TABULATION OF GRAPES, 1899.

ABBREVIATIONS.—Bunch: Form—c, compact; cy, cylindrical; r, roundish; s, shouldered. Berry: Form—o, oval; ov, ovate; r, round. Color: a, amber; b, black; g, greenish; p, purple; r, reddish; w, whitish; y, yellowish. Season: b, beginning; m, middle; e, end.

Name.	Species.	Bloomed.	Ripened.	Received from.	Vigor—Scale 1-10.	Productiveness—Scale 1-10.	Quality—Scale 1-10.	Bunch.		Berry.		
								Form.	Weight in ounces.	Form.	Size.	Color.
Adirondack	Lab. x Vin.	June 13	m Sept.	Ell. & Barry	6	1	8	cy s	2.55	o	6	b
Agawam	Lab. x Vin.	" 18	b Oct.	Hubbard	10	3	6	cy s	3	r	8-9	p b
Alice	Lab.	" 12	b Oct.	T. J. Dwyer	10	4	7-8	cy	4.1	r	4.5	r
Aminia	Lab. x Vin.	" 13	b Oct.	Hubbard	10	2	7-8	cy s	2.4	r o	7-8	b
Barry	Lab. x Vin.	" 10	m Sept.	Hubbard	9	3	6	r o s	2.5	r	6	b
Bell	Vul. x (Bour. x Lab.)?	" 8	m Sept.	Munson	10	10	8	cy s	3.5	r	7	w
Belvidere	Lab.	" 13	b Sept.	Agricultural College	9	6	5	cy s	3	r	6	b
Berkmans	Vul. x (Bour. x Lab.)	" 9	b Oct.	Agricultural College	8	5	8	cy s	2.9	r	4.6	r
Berlin	Lab.	" 10	m Sept.	Hosford	8	1	8	cy s	1.5	r	6	w
Black Eagle	Lab. x Vin.	" 15	m Sept.	Hubbard	4	1	8	cy c s	-----	r	7	b
Brighton	Lab. x Vin.	" 13	m Sept.	Hubbard	10	4	10	cy s	4	r	6-7	p
Burnett	Lab. x Vin.	" 16	m Sept.	Ell. & Barry	8	3	7	cy s	4.7	o	6	b
Cambridge	Lab.	" 12	m Sept.	Barnhart	10	10	7	cy s	4.7	r	7	b
Campbell Early	Lab. x Vin.	" 14	b Sept.	Agricultural College	10	10	8	cy s	7.85	r	9	b
Caywood 60	Lab.	" 10	m Sept.	Caywood	10	10	3-4	cy s	3	r	5-6	b
Centennial	Lab. x Vin.	" 13	e Sept.	Campbell	6	10	10	cy s	2.1	r	4	w
Challenge	Lab. x Vin.	" 8	b Oct.	Barnhart	10	2	3-4	cy s	1.4	r	3-4	r
Childster 2	Lab.	" 13	m Sept.	Childster	6	6	7	cy s	4.3	r	6	r
Childster 3	Lab.	" 13	m Sept.	Childster	9	1	7	cy s	1.35	r	4	r
Childster 4	Lab.	" 14	m Sept.	Childster	10	8	8	cy s	6.4	o	6	r
Clinton	Vul. x Lab.	" 8	b Oct.	Hubbard	10	10	4	cy s	2	r	3-5	b
Columbia	Vul. x Lab.	" 13	b Oct.	Ell. & Barry	6	8	5	r s	2.8	o	6-7	p
Columbian	Lab.	" 8	b Oct.	Farmer	10	8	4	r s	3.4	r o	10	r
Concord	Lab.	" 12	e Sept.	Horne	10	7	6	cy s	5.3	r	7	b
Cortland	Lab.	" 8	b Sept.	Lambert	10	8	3	o s	7.6	r	6	b
Cottage	Lab.	" 8	m Sept.	Hubbard	10	7	5	cy s	3.6	r	6	b
Creveling	Lab. x Vin.	" 8	b Oct.	Hubbard	10	10	6-6	cy s	5	r	4-5	b
Delaware	Bour. x Lab.	" 13	m Sept.	Hubbard	7	10	10	cy s	2.3	r	3	r
Diamond	Lab. x Vin.	" 13	m Sept.	Chase	8	10	8	cy o s	4.65	r	7	w
Diana	Lab. x Vin.	" 13	b Oct.	Hubbard	7	1	7-8	cy	2	r	5-6	r
Dracut	Lab.	" 10	m Sept.	Hubbard	10	4	3	cy o s	5	r	8	r
Duchess	Lab. x Vin.	" 15	e Oct.	Hubbard	9	3	10	cy s	1.8	r o	4-6	w



TABULATION OF GRAPES, 1889.—Concluded.

Name.	Species.	Bloomed.	Ripened.	Received from.	Vigor—Scale 1-10.	Productiveness— Scale 1-10.	Quality— Scale 1-10.	Bunch.		Berry.		
								Form.	Weight in ounces.	Form.	Size.	Color.
Early Victor	Bour. x Lab.	June 13	m Sept.	Hubbard	10	8	8	cy s	3.6	1	4	d
Eaton	Lab. x Vin.	" 15	m Sept.	Hubbard	10	4	4.5	cy s	4.25	1	7.9	d
Elaine	Lab. x Vin.	" 13	e Sept.	Engle	9	1	7.8	cy s	3.8	1	6.7	d
Elvira	Rip.	" 8	e Sept.	Hubbard	10	10	4.5	cy s	3.8	1	4	w
Empire State	Lab. x Vin.	" 12	m Sept.	Hubbard	10	6	8	cy s	3.8	1	4	w
Ether	Lab. x Vin.	" 13	e Sept.	Josselyn	8	5	7	cy s	4.8	1	7	w
Etta	Lab. x Vin.	" 10	b Oct.	Hubbard	10	8	4.5	rs	5.3	1	6.4	w
Geneva	Lab. x Vin.	" 15	m Sept.	Chase	10	8	5	cy s	3.2	1	6	w
Golden Gem	(Bour. x Lab.) x Vin.	" 8	b Sept.	Campbell	6	8	5	cy s	1.1	1	6	w
Goldstein	Lab.	" 8	e Aug.	Thompson	10	10	5	cy s	3	1	8	d
Guineva	Lab. x Vin.	" 10	e Sept.	Engle	10	10	6	cy s	6.4	1	6.8	w
Hall	Lab.	" 13	m Sept.	Hall	10	7	5	cy s	3.7	1	6	d
Harford	Lab.	" 15	b Sept.	Hubbard	7	2	5	cy s	6.4	1	6	d
Hayes	Lab.	" 13	m Sept.	Hubbard	8	1	7	cy s	1.5	1	4	w
Herbert	Lab. x Vin.	" 15	m Sept.	Hubbard	7	2	7	rs	3.6	1	8	d
Honey	Lab. x Vin.	" 12	e Sept.	Engle	8	6	7	cy s	2.85	1	6.7	w
Hosford	Lab.	" 13	m Sept.	Hosford	9	1	6	cy s	6.3	1	9	d
Iona	Lab. x Vin.	" 13	b Oct.	Hubbard	8	7	10	cy s	3	1	6	d
Isabella	Lab.	" 11	b Oct.	Hubbard	10	6	7.8	cy s	3	1	6	d
Ives	Lab.	" 9	e Sept.	Hubbard	10	10	4	cy s	3.15	1	6	d
Janesville	Lab.	" 8	m Sept.	Hubbard	10	1	4	rs	2.85	1	6	d
Jefferson	Lab. x Vin.	" 16	b Oct.	Hubbard	8	5	8.9	rs	3.4	1	5.9	w
Jessica	Bour. x Lab.	" 9	e Aug.	Hubbard	8	5	6	cy s	2.5	1	5.5	w
Josselyn 5	Lab.	" 13	e Sept.	Josselyn	10	6	6	cy	3.3	1	7.9	d
Josselyn 6	Lab.	" 13	b Oct.	Josselyn	8	10	4	cy s	3.4	1	6.9	d
Josselyn 10	Lab.	" 13	e Sept.	Josselyn	10	1	6	cy s	1.6	1	6	d
Lady	Lab. x Vin.	" 14	m Sept.	Josselyn	8	3	6	cy s	2.1	1	7	w
Lindley	Lab. x Vin.	" 13	e Oct.	Hubbard	7	5	7	cy s	3.2	1	5.7	r
Lutie	Lab.	" 10	m Sept.	Parry	9	9	8.9	cy s	5.85	1	8.8	r
Lyon	Lab.	" 15	b Oct.	Childester	10	2	8.9	cy s	3.9	1	8.9	w
Mason	Lab. x Vin.	" 13	m Sept.	Mason	8	8	6.7	cy s	2.2	1	5.9	r
Messacot	Lab. x Vin.	" 12	m Sept.	Hubbard	8	3	7	rs	3.9	1	7	d
Merrimac	Lab. x Vin.	" 10	e Sept.	Hubbard	7	7	7	cy s	2.8	1	7	d
Michigan	Lab. x Vin.	" 16	e Sept.	Engle	10	1	5	cy s	4.9	1	6.7	w
Mullington	Lab.	" 13	m Sept.	Palmer	6	1	5	rs	4.9	1	10	d

Monroe.....	(Bour. x Lab.) x Lab.	" 14	b Oct.	Ell. & Barry	10	3	6	7	cy s	4	O	6-7	b
Moore Early.....	Lab.	" 12	e Aug.	Hubbard	9	6	7	cy s	4.8	I	I	8	b
Moyer.....	Bour x Lab.	" 13	b Sept.	Hubbard	8	4	5	cy s	1.6	I	I	4	w
Nagara.....	Lab.	" 13	e Sept.	Hubbard	10	1	5	cy s	4.4	I	I	7	w
Northern Light.....	Lab.	" 14	e Sept.	Bucke	6	.8	7	cy s	3.8	I	I	4-6	w
Oase.....	Lab.	" 15	b Oct.	Stayman	10	1	5	ro	3	I	O	6-9	b
Owosso.....	Lab.	" 15	e Sept.	Ell. & Barry	10	3	4	rs	2.8	I	O	8	r
Ozark.....	Asst	" 15	b Oct.	Stayman	10	1	5	cy s	3.8	I	O	6-9	b
Peabody.....	Vul.	" 11	m Sept.	Campbell	7	7	7	cy s	4.45	I	I	6	b
Perkins.....	Lab.	" 15	b Oct.	Hubbard	10	5	2	cy s	1.65	ro	ro	6-7	w
Pocklington.....	Lab.	" 10	b Oct.	Hubbard	9	10	6-7	cy s	5.2	I	I	6-9	w
Poughkeepsie.....	Bour x Lab.	June 13	e Sept.	Hubbard	4	5	9	cy s	2.25	I	I	4-6	r
Prentiss.....	Lab. x Vin.	" 15	e Sept.	Hubbard	8	1	7-8	cy	7	I	I	6-7	w
Prezley.....	(Lab. x Vul.) x Lab.	" 9	m Sept.	Munson	9	8	5	cy s	7	I	I	5	r
Progress.....	Lab. x Vin.	" 13	e Sept.	Stayman	10	10	4-5	cy s	1.05	I	I	5-6	b
Pulpless.....	Lab. x Vin.	" 13	m Sept.	Engle	10	1	7	cy s	2.9	I	I	5-9	b
Requa.....	Lab. x Vin.	" 13	m Sept.	Campbell	9	7	8	cy s	4.55	I	I	7	r
Rochester.....	Lab.	" 13	m Sept.	Ell. & Barry	8	9	4	cy s	4.55	O	O	5	b
Rockwood.....	Lab.	" 12	b Sept.	Josselyn	9	8	8	cy s	6.4	I	I	6	d
Rogers 5.....	Lab. x Vin.	" 15	e Sept.	Hubbard	7	3	7	r	2.84	I	I	5-7	r
Salem.....	Lab. x Vin.	" 15	m Sept.	Hubbard	7	4	7	rs	4.05	I	I	8	r
Telegraph.....	Lab.	" 12	e Sept.	Hubbard	8	9	6	cy s	9	I	ro	7	b
Triumph.....	Lab. x Vin.	" 16	b Oct.	Campbell	10	10	6-7	cy s	8.1	ro	ro	7-8	w
Uster.....	Lab. x Vin.	" 8	b Oct.	Caywood	8	10	9	cy c	3.8	I	ro	7	r
Vergennes.....	Lab.	" 12	b Oct.	Hubbard	8	8	8-9	cy s	3.8	I	ro	7-8	w
Vesta.....	Lab. x Vin.	" 13	e Sept.	Engle	10	6	3	rs	3.9	I	I	7-8	w
Victoria.....	Lab.	" 14	e Sept.	Josselyn	8	1	7	cy s	4.45	I	I	5-8	b
Warder.....	Lab.	" 15	m Sept.	Huber	7	8	7	cy s	3.45	I	I	6	b
White Beauty.....	Lab. x Vin.?	" 15	e Sept.	Stayman	8	5	7	cy s	2.6	I	I	4-6	w
White Imperial.....	Lab. x Vin.?	" 10	b Sept.	Stayman	8	4	7	cy s	1.6	I	I	6	w
Wilder.....	Lab. x Vin.	" 13	e Sept.	Hubbard	7	4	7	cy s	2.9	I	I	7	b
Wills.....	Bour x Lab.?	" 13	m Sept.	Campbell	9	1	5	cy s	2.6	I	I	6	w
Winchell.....	Lab. x Vin.	" 13	e Sept.	Ell. & Barry	9	8	9	cy s	3.6	I	I	6	w
Witt.....	Lab. x Vin.	" 13	b Oct.	Campbell	8	4	7-8	rs	2.3	I	I	5-9	w
Woodruff.....	Lab. x Vin.	" 8	b Oct.	Scott	10	10	5	rs	8	I	I	7-8	b
Worden.....	Lab.	" 10	m Sept.	Hubbard	10	10	8	cy s	6.25	I	I	8	d
Wyoming.....	Lab.	" 10	m Sept.	Hubbard	9	1	4	cy s	1	I	I	6	r

## APPLES.

Nearly all varieties of apples of bearing age yielded well this season. Even some of the newer sorts which had not borne before produced full crops. Early in April, the trees, with the exception of a few rows, were sprayed with copper sulphate, one pound to fifteen gallons of water. The rows left untreated when this first spraying was done were given an application of Bordeaux mixture just before the buds opened. This latter treatment where tried has usually given good results by way of preventing the attack of apple scab fungus on the fruit stalks at the time of blossoming, and it was the purpose to further test the effectiveness of this practice. But conditions were not very favorable for the disease at blossoming time last spring and there appeared to be no difference in favor of this treatment as compared with the earlier use of the copper sulphate solution. However, in ordinary seasons there is little doubt but that it pays to spray just before the flower buds open and in some instances it may even be the means of saving the crop. After the blossoms had fallen and again about two weeks later, the trees were sprayed with Bordeaux mixture and Paris green. These several sprayings served to hold fungous diseases well in check, but did not prove so effectual against the work of the codling moth. A few of the late ripening varieties were quite wormy. Doubtless one or two later sprayings would have considerably lessened the damage done by the insect.

Below are given descriptions of varieties not heretofore described in the sub-station reports. They are mostly new sorts which this season proved sufficiently productive to give some indication of their probable worth.

**Arnold.**—Tree vigorous, upright, rather spreading. The fruit is oblate, ribbed; cavity broad, deep, usually russeted; basin deep, slightly corrugated; stalk one and one-fourth inches long, slender; color yellow, sometimes with a brownish red cheek, and usually with patches and net work of russet; calyx small, closed; calyx tube cup-shaped; flesh yellowish, firm, mild, sub-acid, rich, pleasant; quality very good. Season November to March.

**August (Crab.)**—Tree vigorous with roundish head. Fruit roundish conical, with a deep, abrupt cavity, and a narrow, deep basin; stem one and one-fourth inches long, slender; calyx closed, segments long, tips reflexed; calyx tube conical; color yellow, washed with light red, profusely covered with broken stripes of dark dull red, and dotted with many light dots; flesh yellow, juicy, crisp, acid. Season August and September.

**Buckingham.**—Tree upright, slightly spreading, vigorous. Fruit oblate, conical; cavity broad, deep, slightly russeted; basin deep, corrugated, somewhat irregular; stalk medium, one-half inch long; calyx closed; calyx tube conical; color greenish yellow, shaded and splashed with two shades of red; flesh yellowish white, tender, breaking, juicy; flavor sprightly sub-acid. Season November to February.

**Carlough.**—Tree vigorous with a roundish, spreading head, and reddish brown shoots. Fruit roundish conical; cavity medium, slightly russeted; basin small, shallow; stalk three-fourths of an inch long, slender; calyx small, closed; calyx tube short, conical; color greenish yellow with a faint

brownish red cheek; flesh white, tender, juicy, with a mild, sub-acid, pleasant flavor. Ripe in November and apparently a long keeper.

Colton.—Tree vigorous, upright, spreading. Fruit ovate, inclining to conical, slightly ribbed; cavity narrow, regular; basin shallow, ribbed; stalk stout, three-fourths of an inch long; calyx closed; calyx tube funnel shaped; color greenish yellow, often with a brownish red cheek, and sprinkled with many greenish dots; flesh white, fine-grained, rather tender, with a sprightly, sub-acid, very pleasant flavor. Season August. Promising as an early dessert apple.

Cullin.—Tree upright, spreading, slightly lacking in vigor. Fruit roundish, oblong, narrowing toward eye; cavity broad, deep, russeted; basin medium, abrupt, corrugated, somewhat irregular; stem slender, one inch long; calyx closed, usually to a point; calyx tube long, funnel shaped; color yellowish green, rather faintly shaded with brownish red at the base and sprinkled with many light dots toward the crown; flesh firm, crisp, juicy; flavor sprightly, sub-acid. Ripe in January.

Dickinson.—The tree is an upright, slightly spreading, fairly vigorous grower, with rather slender, yellowish brown, slightly downy shoots. Fruit roundish, oblong, inclining to conical; cavity narrow, rather shallow; basin shallow, corrugated; stalk stout, three-fourths of an inch long; calyx short, closed; calyx tube conical; color light yellow, shaded splashed and mottled with bright red and sprinkled with light dots; flesh whitish, tinged with red next to the skin, crisp, tender; flavor brisk, sub-acid. Ripe in November.

Early Ripe.—Tree vigorous with an upright, slightly spreading, compact head. Fruit oblate, somewhat ribbed, with a broad deep, russeted, plaited cavity, and a shallow, plaited basin; stalk stout, one inch long; calyx small, closed; calyx tube funnel-shaped, short; color greenish yellow with russet dots and patches; flesh white, tender, quite juicy, mild, sub-acid, pleasant. Season August.

Excelsior. (Crab)—Tree upright, vigorous, with stout, dark brown shoots. Fruit roundish, slightly oblate; cavity broad, regular; basin shallow, plaited; stalk stout, one inch long; calyx irregular, closed; calyx tube conical; color pale yellow, well overlaid with bright red; flesh whitish, juicy, very tender; flavor, sub-acid. Season August and September. A very handsome fruit of quite good quality.

Family.—A vigorous, upright, spreading grower. Fruit oblate; cavity broad, deep, slightly russeted; basin broad, rather deep, plaited; stalk rather slender, three-fourths of an inch long; calyx small closed; calyx tube broadly conical; color greenish yellow, shaded, striped, and splashed with dull red and sprinkled with many large, light dots; flesh white, tender, juicy, sub-acid, mild, aromatic. Season November to February.

Fink.—Tree an upright, vigorous grower. Fruit small, oblate; cavity medium, very regular, russeted; basin shallow, broad, corrugated; stalk moderately stout, one inch long; calyx medium, open; calyx tube long, funnel shaped; color yellow with a brownish red cheek, sprinkled with a few light dots; flesh whitish, fine grained, compact, aromatic, sprightly, sub-acid. Season December to May.

Florence. (Crab)—Tree upright, spreading, vigorous. Fruit small, oblate; cavity regular broad, deep; basin broad, ribbed, shallow; stalk slender, one inch long; calyx large, nearly closed, segments long, re-

flexed; calyx tube conical; color clear yellow more or less striped with red and dotted with a few grayish dots; flesh yellowish white, tender, juicy, crisp, acid. Season September. Inclined to overbear and the fruit is apt to be small and not well colored because of this tendency.

Gavet Pippin.—From Nova Scotia. Scions received from the Division of Pomology, Washington, D. C., in 1895. Fruit oblate with a broad, deep cavity, lined with greenish russet; basin broad, deep, ribbed; stalk medium, one-half inch long; calyx partly open; calyx tube large, conical; color greenish yellow, sometimes with a faint red blush; flesh white, tender, fine-grained, mild, pleasant. Shoots reddish brown, downy. Season September and October.

Gibb. (Crab)—Tree vigorous with a roundish, upright head. Fruit oblate, inclining to conical with a shallow corrugated cavity; basin broad, very shallow, corrugated; stalk stout, three-fourths of an inch long; calyx large, nearly closed; calyx tube long, cylindrical; color clear pale yellow, sometimes with a faint blush; flesh yellowish, firm, crisp, juicy, sprightly. Season August. Poor in quality and too light colored for a crab.

Hargrove.—Tree vigorous, upright, slightly spreading. Fruit roundish conical; cavity rather narrow; medium depth; basin shallow, plaited; stalk rather slender, three-fourths of an inch long; calyx small, open; calyx tube funnel shaped; color greenish yellow sometimes with a faint brownish red blush; flesh white, firm, mild, sub-acid. Ripe in November.

Hawley.—Tree vigorous, with a round head. Fruit large, roundish, slightly oblate with deep cavity and a medium somewhat plaited basin; stalk medium, three-fourths of an inch long; calyx closed or partly open; calyx tube long, conical; color yellow with many grayish specks; flesh white, tender, juicy, mild, sub-acid, very pleasant. Season early September.

Indiana.—Tree vigorous, upright, spreading. Fruit roundish, flattened at ends; cavity narrow, russeted; basin broad, shallow, slightly corrugated; stalk medium, three-fourths of an inch long; calyx partly open, segments short; calyx tube conical; color yellow, shaded and splashed with red, and sprinkled with russet dots; flesh white tender, mild, sub-acid, pleasant. Season December to April.

Jacob.—Tree fairly vigorous, upright, slightly spreading. Fruit large, oblate, conical; cavity broad, deep; basin deep, abrupt; stalk medium, three-fourths of an inch long; calyx open; calyx tube conical; color yellow with a brownish red cheek, often considerably russeted; flesh white, firm, sweet. Ripe in November.

Jelly. (Crab)—Tree upright, spreading, vigorous. Fruit roundish with an abrupt narrow cavity and a broad regular basin; stalk slender, one and one-fourth inches long; color pale yellow, well overlaid with bright red, and sprinkled with gray dots; flesh white, crisp, juicy, sprightly, sub-acid. Season September and early October.

Kinnard.—Tree vigorous, with a spreading, roundish head. Fruit large, roundish oblate, inclining to conical; cavity broad, deep, russeted; basin deep, furrowed; stalk short; calyx closed or slightly open; calyx tube obtusely conical; color yellow, well overlaid with dark red; flesh yellowish white, tender, juicy, mild, rich, aromatic. If this variety proves

productive it should be of value for market because of large size and attractive appearance. Ripe in December.

**Picket.**—Tree vigorous, upright. Fruit of medium size, roundish oblate, inclining to conical; cavity broad, shallow, russeted; basin narrow, abrupt, slightly plaited; stalk very short; calyx closed or slightly open; calyx tube funnel-shaped; color yellow, blushed and obscurely striped with dark red and sprinkled with light dots; flesh whitish, juicy, mild, sub-acid, almost sweet. Season December to February. An apple of good quality and good appearance.

**Prolific Sweet.**—Tree upright, slightly spreading, somewhat lacking in vigor. Fruit large, roundish conical, with a very broad, deep, russeted cavity; basin rather deep, abrupt, corrugated; stalk stout, one and one-fourth inches long; calyx closed, lobes long, reflexed at tips; calyx tube long, conical; color yellow; flesh white, a little coarse, sweet. Season late August and early September.

**Pryor Red.**—Tree upright, very vigorous. Fruit medium, roundish oblate; cavity small abrupt, irregular; basin small, shallow, plaited; stalk stout, one-half inch long; calyx small, closed or partly open; calyx tube funnel-shaped; color greenish yellow, shaded with red and striped with dark crimson; flesh yellowish, juicy, fine grained, mild, sub-acid. Season January to March.

**Red Russet.**—Tree moderately vigorous, upright, spreading. Fruit small, roundish, with a medium round cavity; basin round regular; stalk rather stout, three-fourths of an inch long; calyx partly open, tips of segments reflexed; calyx tube short, conical; color red, well overlaid with cinnamon russet; flesh white, firm, juicy, sprightly, sub-acid. Season November to March. Fair for dessert purposes but does not appear promising for market, because of small size, and rather unattractive appearance.

**Summer Lievland.**—Tree an upright, vigorous grower. Fruit roundish oblate; cavity narrow, regular; basin broad, plaited; stalk one inch long, medium; calyx closed, tips of segments reflexed; calyx tube funnel-shaped; color greenish yellow with a few splashes of light red on exposed side; flesh white, tender, fine grained, sub-acid, pleasant. Season August.

**Thompson 29.**—Tree vigorous, upright, slightly spreading. Fruit roundish, inclining to conical; cavity medium, regular, russeted; basin narrow, abrupt, corrugated; stalk moderately stout, three-fourths of an inch long; calyx open, segments reflexed; calyx tube conical; color greenish yellow sprinkled with white dots; flesh white, tender, fine grained, mild, sub-acid. Season October.

**Townsend.**—Tree vigorous with an upright compact head. Form roundish oblate, slightly conical; cavity broad, deep; basin rather shallow, corrugated; stalk medium, one and one-fourth inches long; calyx small, closed; calyx tube short, conical; color light yellow, splashed and striped with red; flesh white, tender, mild, sub-acid, pleasant. Season September.

**Whinnery.**—Tree vigorous with a roundish, upright, compact head. Fruit roundish conical, frequently oblique; cavity regular, rather deep, russeted; basin shallow, corrugated; stalk medium, one inch long; calyx small, closed; calyx tube funnel shaped; color light yellow, shaded with bright red and sprinkled with russet dots and patches; flesh white, tender fine-grained, sub-acid, pleasant. Season December to February.

TABULATION OF APPLES, 1899.

ABBREVIATIONS—Month: b, beginning; e, end; m, middle. Form: a, conical; i, irregular; o, oblate; ob, oblong; ov, ovate; r, roundish. Color: g, green; r, red; ru, russet; s, striped; w, white; y, yellow. Texture: c, crisp; d, dry; f, firm; j, juicy; t, tender. Flavor: a, acid; m, mild; s, sweet. Use: c, cider; d, dessert; k, kitchen; m, market.

Name.	Planted	Vigor.	Bloomed.	Ripe	Season.	Weight in ounces.	Form.	Color.	Texture.	Flavor.	Quality—Scale 1-10.	Use.
Arnold	1890	9	May 4	November	Nov. Mar.?	7	o	yr	f	m	8	d k m
Alexander	1892	8	" 4	m September	Sept.	8.55	o c	g yr	t c	m	6	k m
Halley Sweet	1888	7	" 4	e September	Nov. Mar.	9.1	r	r	t	s	7-8	d k
Battulen	1898	10	" 4	November	Nov. Mar.	3.5	ro	yr	t	a	6-7	d k m
Borovinka	1898	10	" 2	m August	Sept.	6.25	ro	yr	t	a a	5	k m
Bottle Greening	1890	10	" 4	November	Nov. Feb.	5.45	o c	g yr	t	m	7-8	d
Bough	1888	10	" 6	m August	Aug.	7.5	ro	y	t	s	9-10	d k
Bradford	1890	9	" 3	December	Dec. Mar.	3.8	ro	g r	t c	a	4	m
Buckingham	1892	10	" 6	November	Nov. Feb.	6.3	o c	g yr	t j	a	7	d m
Carough	1892	10	" 6	November	Nov. Mar.?	4.55	ro	g yr	t j	m	7	d
Chenango	1888	10	" 8	e August	Aug. Sept.	5.5	o b c	yr s	t	m	8	d
Cogswell	1888	9	" 5	November	Nov. Mar.	6.75	ro c	yr	t c	m	5-6	d m
Colton	1888	9	" 3	e August	Aug. Sept.	4.1	co v	g w	t j	m	6-7	d
Cornell	1890	8	" 6	e September	Sept.	6.2	re	yr	t	m	7	d
Crain	1888	10	" 4	December	Dec. Mar.?	2.8	o	yr	f	a	6	k
Cullin	1890	8	" 6	January	Jan. April?	6.1	ro b	g yr	f o j	a	5-6	m
Day	1891	9	" 4	b September	Sept. Oct.	6.25	re	yr	f t	m	3-4	k
Decarie	1890	10	" 8	b September	Sept.	8.6	r	r	t	m	5	k
Dickinson	1889	8	" 4	November	Nov. Feb.?	5.2	ro b o	yr	t c	a	5	m
Dyer	1888	8	" 3	b September	Sept. Oct.	7.66	ro	yr	t	m	9	d
Early Ripe	1891	10	" 4	b August	Aug.	3.9	o	g yr	t j	m	7	d
Early Strawberry	1891	10	" 4	m August	Aug.	2.65	ro	yr	t j c	a	8	d k
Fall Pippin	1891	10	" 4	October	Oct. Dec.	11	r	g yr	t c	m	7-8	d m
Family	1891	10	" 4	November	Nov. Feb.?	4.75	o	g yr	t j	m	6	d m
Fanny	1890	10	" 5	b September	Sept.	5.6	ro	yr	t j	m	7	d m
Fink	1892	9	" 4	December	Dec. Dec.	2.2	o	yr	t	a	4-5	m
Gano	1891	10	" 4	December	Dec. Mar.?	2.6	ro	g yr	t	m	5	k
Gavet	1895	7	" 6	e September	Sept. Oct.	7.2	o	g yr	t c	a	7	k m
Glodeon	1890	10	" 3	m September	Sept. Jan.	6	ro b o	yr	f c	a	5	k m
Gill	1892	9	" 6	November	Nov. April?	8.6	ro d	yr	f	m	4-5	m
Golden Russet	1888	9	" 3	November	Nov. Mar.	2.65	ov	yr	ot	m	4	k
Golden Russet	1898	10	" 1	December	Dec. April.	2.9	ro	yr	f	m	7-8	d m
Gravenstein	1892	10	" 4	b September	Sept.	7	ro	yr	t o	a	8	k m

Grimes	1890	4	Dec. Mar.	4.5	rob	y	ct	m	8-9	d
Grosh.	1890	3	Sept. Oct.	5.8	ro	gyr	c	m	6	dk
Haas	1892	7	Sept. Oct.	6.4	oc	gyr	t	a	5-6	m
Hagenkopt.	1898	10	Sept.	7.25	ro	yr	f	a	5	m
Hargrove	1892	2	Nov. Mar.	3.5	ro	gyr	f	a	4-5	m
Hawley	1898	6	Sept.	10	r	y	tj	m	8	d
Hubbardston	1898	10	Nov. Jan.		ro	yr	to	m	8	dm
Hurbut	1892	4	Oct. Dec.	4.7	r	yr	f	m	7	d
Indiana	1892	10	Nov. Feb.	6.6	ro	yr	to	m	4-5	m
Indiana Favorite	1892	9	Dec. April	4.5	ro	yr	to	m	6	d
Iowa Keeper	1891	3	Dec. Dec.	4.45	o	gyr	f	m	4-5	m
Jacob	1899	8	Nov. Feb.	8	oc	yr fu	f	s	6	dm
Jeffers	1898	3	Sept.	6.25	ro	yr	t	s	10	d
Jersey Sweet	1898	9	e Aug.	5.25	r	yr	ot	s	8	dk
Jonahban	1898	4	Nov. Mar.	4.4	ro	yr	ot	a	10	dkm
Keawick	1898	4	Aug. Sept.	5	ro	yr	o	a	5-6	k
Kinnard	1892	10	Dec. Mar.	7.7	ro	yr	tj	m	7-8	dm
Lawver	1890	6	Jan. May	5.5	ro	yr	f	m	6-7	dm
Lumber Twig	1892	9	Dec. April	3.5	ro	gyr	fj	a	4-5	m
Longfield	1892	2	Sept. Oct.	5.06	ro	yr	ct	a	5	km
Lou.	1890	4	e July	4.03	rov	yr	ct	a	4	k
Louise	1890	10	Nov. Jan.	5.25	r	gyr	ct	m	7-8	dm
Lowell	1890	5	Sept. Oct.	9	ob	y	tj	m	7-8	dm
Loy	1890	5	Oct. Nov.	5.6	o	yr	to	m	6-7	dm
Malden Hush	1892	4	Sept. Oct.	5.8	o	yr	to	a	6-7	dkm
Marmalade	1898	4	Sept. Oct.	6.06	ro	yr	o	s	3-4	t
Mason Orange	1890	9	Nov. Jan.	8	rob	yr	ot	m	7-8	dm
McIntosh	1890	10	Nov. Feb.	6.9	ob	yr	t	m	7-8	dm
Munson	1890	9	Sept.	3.6	o	y	to	s	6	dkm
Nero	1890	5	Dec. May	4.1	ro	yr	to	s	6-7	dm
Northfield	1890	5	Sept. Dec.	7.15	ro	yr	ot	m	5	km
Oakland	1898	9	Nov. Mar.	5.5	o	yr	t	m	7-8	dm
Oldenburg	1892	8	Aug. Sept.	6.45	o	yr	c	a	4-5	km
Ontario	1890	6	Dec. April	9	o	yr	t	m	4-5	km
Peck	1898	6	Nov. Mar.	7	r	yr	t	m	8-9	dm
Peter.	1890	4	Sept. Oct.	6.1	oc	yr	tj	a	5-6	km
Picket	1898	8	Dec. Feb.	9	ro	yr	t	m	6-7	dm
Pine Stump	1892	8	Nov. Mar.	5.15	r	ru	t	m	6-7	dm
Primate	1898	10	Aug. Sept.	5	ro	yr	f	s	9	dm
Proline Sweet	1890	7	e Aug.	5	ro	y	f	s	5	d
Prior Red Seedling	1898	9	Dec. Mar.	5.2	ro	gyr	t	m	5-6	m
Quince, Cole	1892	10	Aug. Sept.	4.6	ro	y	t	a	4-5	k
Rambo	1890	4	Oct. Dec.	4.95	ob	yr	t	m	7-8	dk
Ramsdell Sweet	1898	10	Nov. Feb.	9	oc	yr	t	s	6-7	dm
Red Aport	1898	10	Sept. Nov.	5.6	ro	gyr	c	a	5	km
Red Astrachan	1898	2	Aug.	5.6	ro	gyr	c	a	6	dkm



# MICHIGAN EXPERIMENT STATION.

Name.	Planted.	Vigor.	Bloomed.	Ripe.	Season.	Weight in ounces.	Form.	Color.	Texture.	Flavor.	Quality—Scale 1-10.	Use.
Red Dettmer.....	1888	10	May 3.....	b September.....	Sept. Oct.....	7.65	roc	yrs	ct j	s	6	k
Red June.....	1892	10	" 4.....	b August.....	Aug.....	3.7	roc	r	f j	s	8-9	d m
Red Russet.....	1900	9	" 6.....	November.....	Nov. Mar.....	3.1	r	ru	f j	s	6	d
Rhode Island.....	1888	10	" 4.....	November.....	Nov. Mar.....	11.5	roc	gy	tc	s	6-6	d k m
Rosenhager.....	1888	10	" 4.....	m October.....	Oct. Dec.....	11.5	roc	yr	tc	s	6-6	k m
Roxbury.....	1890	10	" 4.....	November.....	Nov. June.....	4.6	ro	yr	tc j	s	7-8	d k m
Scarlet Cranberry.....	1891	9	" 4.....	December.....	Dec. April.....	4	o	yr	f j	m	5	m
Sheriff.....	1891	10	" 4.....	December.....	Dec. Mar.....	6.5	rob c	gy	t	m	7	d
Shilawasee.....	1888	10	" 4.....	October.....	Oct. Dec.....	5.3	roc	yr	tc	m	8	d
Somerset.....	1893	8	" 4.....	e August.....	Aug. Sept.....	3.2	o	y	tc	s	6	d
Stark.....	1888	10	" 3.....	December.....	Dec. May.....	8.8	rob c	gyrs	rc	m	4-5	m
Stuart.....	1900	10	" 6.....	November.....	Nov. Jan.....	4.5	ro	gyr	ct	s	5-6	k
Stump.....	1899	9	" 4.....	b September.....	Sept. Oct.....	3.8	rc	w	t	m	6	k
Summer Liveland.....	1900	10	" 2.....	m August.....	Aug.....	3.25	ro	gyr	t	m	7	d
Summer Pearmain.....	1888	10	" 4.....	m September.....	Sept.....	4.6	ob	yr	t	m	10	p
Summer Rose.....	1892	9	" 4.....	b August.....	Aug.....	2.9	ro	yrs	t j	m	8	d
Tolman.....	1898	9	" 6.....	November.....	Nov. Mar.....	5.25	ro	y	f	s	7	k m
Thaler.....	1888	10	" 3.....	b August.....	Aug.....	5.7	ob	yr	tc	s	5	k m
Thompson 29.....	1894	10	" 5.....	October.....	Oct. Nov.....	4	rc	gy	t	s	5-6	k
Tikova.....	1888	7	" 2.....	m August.....	Aug. Sept.....	7.9	ob c	gyr	ot	m	5-6	k m
Townsend.....	1890	10	" 6.....	e August.....	Aug. Sept.....	6.7	roc	yrs	t	m	7	d
Washington Strawberry.....	1890	9	" 3.....	e August.....	Aug. Sept.....	11.1	oc	yrs	ot	s	7	d k m
Water.....	1890	8	" 6.....	November.....	Nov. Dec.....	3.4	ro	w yr	t	s	6	m
Wealthy.....	1890	8	" 3.....	b September.....	Sept. Oct.....	7	ro	yrs	t	s	6-7	d
Whinnery.....	1890	10	" 4.....	December.....	Dec. Feb.....	4.45	ro	yr	t	m	7	d
Winter Strefling.....	1888	9	" 3.....	b September.....	Sept.....	8.85	ro	yrs	t	s	4-5	k m
Yellow Transparent.....	1888	10	" 5.....	e July.....	Aug.....	5	r	y	t	s	6-7	k m
York Imperial.....	1892	10	" 6.....	November.....	Nov. Feb.....	3.8	o	yrs	f	s	5	m
Zolotaref.....	1890	8	" 4.....	m August.....	Aug.....	7.45	r	yrs	rc	m	5	m
Zuzof.....	1890	9	" 6.....	b September.....	Sept. Oct.....	4	rc	yr	t	m	4	m

TABULATION OF CRAB APPLES, 1899.  
*Pyrus baccata*; including actual and supposed hybrids.

ABBREVIATIONS—Month: b. beginning; e. end; m. middle. Form: c. conical; i. irregular; o. oblate; ob. oblong; ov. ovate; r. roundish. Color: g. green; r. red; ru. russet; s. striped; w. white; y. yellow. Texture: c. crisp; d. dry; f. firm; j. juicy; t. tender. Flavor: a. acid; m. mild; s. sweet. Use: c. cider; d. dessert; k. kitchen; m. market.

Name.	Planted.	Vigor.	Bloomed.	Ripe.	Season.	Weight in ounces.	Form.	Color.	Texture.	Flavor.	Quality—Scale 1-10.	Use.
August.....	1890	8	May 2.....	m August.....	Aug. Sept.....	4.1	ro	yrs	ct	m	5	k
Dartmouth.....	1890	10	" 2.....	e August.....	Aug. Sept.....	1.62	o	r	c	m	10	dk
Excelsior.....	1890	10	" 3.....	m August.....	Aug. Sept.....	4.5	ro	yrs	c	a	6	km
Florence.....	1890	8	" 2.....	b August.....	Aug. Sept.....	1.1	o	yrs	tc	a	6	k
Gibb.....	1890	8	" 1.....	" August.....	Aug.....	1.9	o	y	fc	a	2	c
Jelly.....	1890	10	" 4.....	m September	Sept. Oct.....	1.25	r	yr	cf	a	5-6	k
Martha.....	1890	8	" 4.....	e August.....	Aug. Sept.....	1.7	o	yr	ct	a	9-10	k
North Star.....	1890	8	" 2.....	b August.....	Aug.....	.9	ro	yr	t	m	4-5	k
No. 1 New.....	1890	10	" 5.....	m August.....	Aug.....	7.75	r	gys	t	a	7	dm
No. 2 New.....	1890	10	" 3.....	e August.....	Sept.....	4.4	o	gys	t	a	5	km
Quaker.....	1891	10	" 3.....	m September	Sept. Jan.....	2	rov	yr	c	m	4	k
Transcendent.....	1893	9	" 3.....	e August.....	Sept.....	1.8	rob	yr	c	m	8	km
Whitney 20.....	1890	10	" 1.....	m August.....	Aug.....	2.45	r	yr	c	m	9	dkm

## NUTS.

There are now thirty-seven varieties of nuts in the sub-station collection, including almonds, chestnuts, filberts, hazelnuts, pecans, and walnuts. A number of new varieties were put out last spring.

## ALMONDS.

Snelling was badly injured by the winter. It is a hard-shelled variety planted in 1892. Previous to last winter it seemed vigorous and hardy and bore some fruit. Two new trees of a hard-shelled kind were set last spring.

## CHESTNUTS.

Comfort.—Tree upright, spreading, moderately vigorous. Nuts large, of good quality. Only a few specimens borne. Resembles Paragon somewhat.

Japan Giant.—Tree a slow, spreading grower, somewhat lacking in vigor. The nuts are very large, but lack quality.

Numbo.—Nuts large, smooth, attractive. Not equal to Paragon in quality. The trees were set in 1892 and have grown very slowly.

Paragon.—This seems to be the most valuable variety which has thus far fruited. Trees upright, spreading, quite vigorous. Nuts large, of good quality. A good crop was borne this season.

Spanish.—Trees winter-killed badly. An upright, spreading, moderately vigorous grower. Nuts of large size, with heavy shuck. Quality very good.

## FILBERTS.

Cosford matured some fine specimens this season. The nuts are long, thin-shelled, of fine quality. Bush vigorous and hardy.

Kentish Cob, planted in 1892, has as yet borne no fruit. Last winter the catkins were all frozen. The bush itself seems quite hardy.

## WALNUTS.

Japan Walnut.—*Juglans Seiboldii*, again bore a full crop of nuts. The trees are rapid, strong growers and may have value for ornamental purposes rather than for the fruit which does not equal our native butternut or walnut in flavor and quality.

Persian or English walnuts have grown very slowly here and as yet have borne no fruit. A number of new varieties were put out last spring, but judging from the behavior of those several years planted it is very doubtful whether they will prove of value here.

S. H. FULTON.

South Haven, Mich., December 1, 1899.

BULLETIN 178

JANUARY, 1900

# MICHIGAN STATE AGRICULTURAL COLLEGE EXPERIMENT STATION

FARM DEPARTMENT

AGRICULTURAL  
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—OF—  
CALIFORNIA.



## THE PRODUCTION AND MARKETING OF WOOL

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By HERBERT W. MUMFORD

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AGRICULTURAL COLLEGE, MICHIGAN  
1900

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174. Fertilizer Analyses.
175. Some Insects of the Year 1898.
176. Strawberry Notes for 1899.

## SPECIALS.

9. Farm Accounts. 10. Sugar Beets. 12. Spraying Calendar.

**MICHIGAN**  
**STATE AGRICULTURAL COLLEGE**  
**EXPERIMENT STATION**

**FARM DEPARTMENT**

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**THE PRODUCTION AND MARKETING OF WOOL**

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**By H. W. MUMFORD**

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**AGRICULTURAL COLLEGE, MICHIGAN**  
**1900**

*The Bulletins of this Station are sent free to all newspapers in the State and to such individuals interested in farming as may request them. Address all applications to the Secretary, Agricultural College, Michigan.*

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## SUB-STATIONS

Grayling, Crawford County, 80 acres deeded.  
 South Haven, Van Buren County, 10 acres rented; 5 acres deeded.

## **THE PRODUCTION AND MARKETING OF WOOL.**

HERBERT W. MUMFORD.

### **SUMMARY.**

1. The outlook for fine wools is bright, due to the almost universal falling off in numbers of Merinos kept not only in Michigan and the United States, but in nearly every wool growing country.

2. It is very doubtful indeed if the American wool grower can ever afford to ignore the ultimate value of the carcass producing the fleece.

3. Mutton growing with wool as an incidental product will continue to be a profitable industry.

4. Every pound of wool consumed in the United States can be profitably grown here.

5. Breed and feed affect the value of wool from the manufacturer's standpoint. Indiscriminate crossing is unprofitable. A sheep poorly nourished cannot produce a healthy fleece.

6. The manufacturer buys wool on the basis of its true value for manufacturing purposes. The grower, the local dealer, the commission man and the scourer should each make an honest effort to satisfy his reasonable demands.

7. Through established market prejudice against Michigan wools, for which prejudice the wool growers of Michigan in former years are largely responsible, and through the lack of care in preparing Michigan wools for the market, the wool growers of Michigan are losing \$200,000.00 annually.\*

8. A small linen, or flax or hemp twine is best for tying wool.

(The sample of twine accompanying this bulletin is linen and can be recommended for tying wool.)

9. Coarse, heavy paint marks should be avoided in marking sheep.

10. More and better wool can be secured by early shearing.

11. Loose, bulky fleeces sell best in the market.

12. Country wool buyers can greatly aid in an effort to bring Michigan wools up to the standard, by buying wool on its merits. By offering an advance in price for wools, properly grown and prepared for the market and by discriminating against poorly grown, dirty or poorly tied fleeces.

13. Commission men and wool manufacturers must buy Michigan wool on its merits. They must pay as much for wools grown in Michigan as those grown elsewhere, provided, of course, they are equal in condition and quality.

14. The first thing necessary is for growers to remove objectionable features of Michigan wool; the next to insist that dealers and manufacturers buy wool on its merits.

15. Avoid lime and sulphur as a sheep dip.

\*This is a low figure. Estimating the annual wool product of Michigan at 10,000,000 pounds, a conservative estimate, and the reduction of price 2 cents per pound, much less than the actual reduction, we get the \$200,000.00 loss.



## THE PRODUCTION AND MARKETING OF WOOL.

During the past six or eight years we have been impressed with the fact that but very few farmers in Michigan, even among those who keep sheep, have been paying much attention to the wool product of their flocks. Flock owners have rightfully complained of the low prices for all grades of wool without having confidence enough in the future to apply their intelligence and energy toward the improvement of their flocks along wool-bearing lines. It is safe to say that very much the same condition exists throughout the United States.

Present conditions point to a more satisfactory market, especially for some grades of wool. It seems, therefore, that this is an opportune time to place before our farming population a few investigations recently made by the writer concerning the wool industry, together with certain facts relating to the growth of wools.

## CAN THE KEEPING OF SHEEP FOR THE PRODUCTION OF WOOL ALONE BE MADE PROFITABLE?

It is very doubtful whether the time will ever come when the keeping of sheep for the production of wool alone can be made profitable in Michigan or in many localities in the United States.

Wool growing upon such a basis must, in the future, be confined to localities remote from the great meat consuming centers, where farmers are unprovided with rapid transportation to these centers, or where the cost of transportation of mutton would be so high as to render the carcass of little or no value.

A moment's consideration would suggest that wool growing under such conditions could only be made profitable upon cheap lands where the herding of large flocks would be possible and where the climate and other conditions would be favorable to the development of sheep and the healthy growth of the wool fiber.

We can conceive how present conditions might be so changed as to render sheep husbandry profitable, if the wool product only were taken into account. It is not probable, however, that we shall ever see a repetition of conditions which existed earlier in this century. It is not probable that the price of the finer grades of wool will go so high that the breeder, even of that class of sheep, can afford to entirely overlook the ultimate value of the carcass for the block.

We expect to see, in the future more than in the past, two classes of sheep raisers in Michigan and throughout the United States. One class will keep sheep for the primary object of producing mutton, with wool as a secondary or incidental product; the other will aim to produce wool first and mutton second. Whether the production of wool or mutton should be the aim of the breeder will depend upon his personal preference and upon his capacity. Some sheep raisers will prefer the mutton breeds, others the Merino.

The great mass of sheep owners will vacillate from breeding grades of the one to breeding grades of the other as conditions favorable to the production of wool or mutton at the time seem to render the one or the other more profitable.

It is not hard to see that the ranchman who can run large flocks of sheep in bands, and who has at his command an almost unlimited grazing ground, can produce wool more economically than the general farmer who keeps a flock and looks upon it simply as an incidental contributor to his income.

The owners of small flocks then, soonest feel the effects of depression and are most apt to quickly dispose of their flocks after one or two unprofitable years.

A careful study of the following pages of this Bulletin will, I trust, impress upon the minds of flock owners the desirability of choosing one or the other of these lines of sheep husbandry and adhering to it year after year.

Not until the wool growers of this country are content to do this will the sheep industry, viewing it either from the purely wool producing or the mutton producing standpoint, ever take its place in the front rank of the great sheep growing countries of the world.

We believe future conditions will bear us out in the statement that there will be very few years when the man who has a flock of either mutton or wool sheep of good quality, who pursues careful and painstaking methods in handling them, will fail to secure a net profit.

There is a promising outlook for the American farmer who economically produces wool and mutton. I doubt if we shall again see the time when the flock master can secure a net profit from his flock unless he makes a thorough study of the industry, knows what he is trying to do, and how he is to accomplish his ends, and is willing to settle upon a policy of breeding and rigidly adhere to it.

May I venture to suggest here that one of the greatest sources of loss to the American farmer has been his vacillating from one line of breeding to another, from one rotation of crops to another, and from one system of farming to another.

Use all of the means at hand to decide the wisest line of sheep husbandry to pursue under your conditions, and then do not deviate from it without the best of reasons. Remember that a constant, persistent and settled policy is best.

In connection with this subject the question naturally arises,—Can sheep husbandry be made profitable by disregarding entirely the wool product? In some few favored localities such a course of sheep husbandry may be made profitable, but under ordinary conditions the wool product contributes materially to the net income from the flock. In some instances breeders of mutton sheep have realized as much for their wool as the men who have been keeping sheep primarily for the wool which they produce. In making such a claim it should not be forgotten that the American markets in the past have not been glutted with a large supply of the medium and coarse grades of wool, while the scarcity of fine wools, owing to the common stock of the country being largely Merino grades, has not been apparent until within the past few months, although a few of the breeders of Merino sheep have persistently prophesied that former conditions would return, and that the grading up of flocks for the

production of the finer grades of wool would again profitably engage the attention of American sheep men.

Fashion in the manufacture of woollen fabrics, which has always been a potent factor in the price of different grades of wool, has seemed to encourage the growth of medium and coarse wools. While the future of the wool industry will be settled by conditions almost entirely beyond the control of the growers of this country, still everything points to a brighter prospect for the wool grower than for several years past and especially for the producer of Fine Delaine wools.

### WORLD'S WOOL PRODUCTION.

The number of sheep in the world in 1894, according to S. N. D. North, was 571,163,062, and the amount of wool produced from the above sheep was 2,692,986,773 pounds, showing the average weight of fleece per head to be 4.7 pounds.

### WOOL PRODUCT OF THE UNITED STATES.

From the same authority we learn that in the United States, during the same year, there were 45,084,017 sheep, producing 325,210,712 pounds of wool. By this we see the United States produces about one-eighth of the world's supply of wool. The average weight of fleece in the United States is 7.21 pounds; over two pounds per head above the world's average.

For the last twenty years the number of sheep in the United States has varied from approximately 40,000,000 to 50,000,000; the latter figure was exceeded in 1884, while in 1894 the number was estimated at 45,048,017.

Current prices for wool and mutton, combined with other conditions, which have made the production of one or the other of these products unprofitable, have caused this variation in the number of sheep kept and a similar variation in the amount of the mutton and wool produced. It has not been due to an over production of wool, for statistics show that never has home grown wool excelled or even equalled the consumption of wool in the United States.

No one can consistently say that we ought not to produce at home every pound of wool consumed within our borders. The natural adaptability of many parts of the country for sheep raising suggests that we should, in every way possible, so adjust our farming operations, and our commercial and economic conditions, that the farms in the United States can produce at least all of the wool needed for home consumption, and that at a fair profit. From statistics furnished in the Wool Book for 1895, issued by the National Association of Wool Manufacturers, we learn that 453,048,456 pounds of wool were consumed in the United States during the year 1894. The wool produced in the United States during the previous year, which would naturally contribute to such consumption, amounted to 348,538,138 pounds. This shows that we produce little more than three-fourths of the wool consumed. Since it is a well known fact that the per capita consumption of the wool in the United

States has steadily increased from 4.49 pounds in 1840 to 9.07 pounds in 1890, it is clear that wool growers have a prosperous future before them, if only they will give more careful attention to growing, preparing for market, and to developing markets for their home grown products.

An advance in prices of wools tends to stimulate the industry. More wool is grown, but the manufacturer is obliged to pay higher prices for the raw material. It is difficult for clothiers to get a correspondingly high price for manufactured goods so that the usual result is that manufacturers substitute, where possible, part cotton. The consumer gets his clothing just as cheap, but does not get all-wool goods. We have urged sheep growers in the United States to grow all the wool consumed in the United States. We would go still farther and call attention to the vast undeveloped markets for manufactured products. When we remember that of the inhabitants of the world there are 250,000,000 who do not wear clothes with 100,000,000 more who wear only about one-half as many as they should, we can see great opportunities ahead in the way of markets for manufactured goods. Perhaps woollen goods would not be suitable,—then let garments manufactured from cotton and other fibers be used, leaving a clearer field for the wool producer who must now compete in a measure with producers of vegetable fibers grown at a minimum of cost.

By referring to the table below it will be seen that the average weight of fleece for Michigan in 1894-1895 was 6.01 pounds, a trifle over a pound per head below the average for the United States.

There is no good reason why the average weight of fleece for Michigan should not be as great as the average for the United States. If Michigan does not come up to the standard it is more the fault of the farmers and sheep breeders than of any lack of favorable conditions, either of climate or locality.

The table below will be interesting to Michigan wool growers.

Table showing number of sheep, number of pounds of wool, and average wool per sheep in Michigan from 1878 to 1898.

*\*Table compiled from Vols. 1 to 20 inclusive of Farm Statistics of Michigan.*

	No. of Sheep.	No. pounds of wool.	Average per head.
1878-79.....	1,670,790	8,666,467	5.19
1879-80.....	1,828,680	9,582,034	5.23
1880-81.....	1,966,962	10,724,107	5.45
1881-82.....	2,137,232	11,577,455	5.42
1882-83.....	2,240,965	12,737,343	5.68
1883-84.....	2,374,555	13,375,903	5.63
1884-85.....	2,453,897	13,827,542	5.63
1885-86.....	2,365,086	13,344,566	5.64
1886-87.....	2,123,049	12,362,799	5.81
1887-88.....	2,088,492	12,589,239	6.03
1888-89.....	2,039,974	12,451,103	6.10
1889-90.....	1,945,382	11,983,765	6.16
1890-91.....	1,947,258	11,732,395	6.20
1891-92.....	1,937,649	12,234,435	6.31
1892-93.....	2,014,630	12,641,745	6.27
1893-94.....	2,068,063	12,692,920	6.14
1894-95.....	2,040,698	12,267,007	6.01
1895-96.....	1,752,414	10,814,366	6.17
1896-97.....	1,333,127	8,392,742	6.30
1897-98.....	1,260,295	8,207,594	6.51

*\*From Farm Statistics 1898-99, just received, we learn that the number of sheep in the State is 1,366,353, yielding a total of 9,053,918 lbs. of wool or an average of 7 lbs. per head.*

This table exhibits two important facts:

First, Taking the last twenty years into consideration we had the largest number of sheep in 1884, and the smallest number in 1898. There was not quite so much wool produced in 1898 as in 1878. This leads us to the conclusion that *Michigan farms are not over stocked with sheep.*

Second, There has been an almost unbroken improvement in the average amount of wool per head for the last twenty years. The causes for this improvement will be discussed in the subsequent pages of this Bulletin.

*Table showing total Number of Sheep, total Number of Pounds Wool and Weight of Fleece per Head in Michigan by counties, compiled from Farm Statistics of Michigan, 1897-98.*

Counties.	No. of Sheep.	No. Pounds of Wool.	Average per Head.
Alcona.....	1,632	8,804	5.39
Alger.....	22,809	140,889	6.18
Allegan.....	1,967	12,583	6.50
Alpena.....	2,051	13,120	6.40
Antrim.....	937	6,197	6.61
Arenac.....	12	85	2.92
Baraga.....	38,944	235,124	6.04
Barry.....	1,817	11,885	6.54
Bay.....	392	2,802	7.30
Benzie.....	15,514	100,150	6.46
Berrien.....	49,396	297,135	6.02
Branch.....	52,087	325,681	6.26
Calhoun.....	28,244	184,627	6.54
Cass.....	1,800	11,317	6.08
Charlevoix.....	732	5,283	7.22
Cheboygan.....	1,581	8,728	5.52
Chippewa.....	1,904	12,814	6.73
Clare.....	46,322	282,037	6.09
Clinton.....	140	968	6.91
Crawford.....	567	3,106	5.40
Delta.....	171	1,069	6.25
Dickinson.....	54,759	342,079	6.25
Eaton.....	906	5,724	5.91
Emmet.....	43,196	286,508	6.63
Genesee.....	760	5,040	6.64
Gladwin.....	1,468	10,874	7.43
Gogebic.....	33,908	198,357	5.85
Grand Traverse.....	46,519	282,343	6.07
Gratiot.....	21	124	5.90
Hillsdale.....	23,344	159,929	6.85
Houghton.....	50,879	343,712	6.76
Huron.....	42,466	274,815	6.47
Ingham.....	17,466	110,778	6.34
Ionia.....	52,434	350,377	6.68
Isabella.....	31,896	211,416	6.63
Isle Royal.....	630	4,239	6.73
Jackson.....	24,484	157,843	6.45
Kalamazoo.....	1,502	11,813	7.86
Kalkaska.....	43,755	311,516	7.12
Kent.....	866	6,072	7.01
Keweenaw.....	51,399	337,099	6.56
Lake.....	49,272	344,397	6.99
Lapeer.....	92	490	5.33
Leelanau.....	302	1,608	5.32
Lenawee.....	24,678	173,898	6.99
Livingston.....	1,092	7,622	6.96
Luce.....			
Mackinac.....			
Macomb.....			
Manistee.....			

Table showing total number of Sheep, etc.—CONCLUDED.

Counties.	No. of Sheep.	No. Pounds of Wool.	Average per Head.
Marquette .....	181	1,182	6.53
Mason .....	1,620	10,414	6.43
Mecosta .....	6,468	44,418	6.87
Menominee .....	640	4,291	6.70
Midland .....	4,712	26,750	5.68
Missaukee .....	796	5,343	6.72
Monroe .....	13,348	75,423	5.65
Montcalm .....	13,264	83,588	6.30
Montmorency .....	296	1,960	6.62
Muskegon .....	3,404	22,506	6.6
Newaygo .....	8,645	54,147	6.26
Oakland .....	48,668	335,673	6.90
Oceana .....	5,050	33,858	6.70
Ogemaw .....	2,252	15,728	6.98
Ontonagon .....	56	370	6.61
Oscoda .....	6,813	47,891	7.03
Oscoda .....	691	5,608	8.12
Otsego .....	44	248	5.64
Ottawa .....	6,814	39,720	5.83
Presque Isle .....	1,166	6,002	5.15
Roscommon .....	98	510	5.20
Saginaw .....	15,674	95,907	6.12
St. Clair .....	20,748	121,426	5.85
St. Joseph .....	24,305	150,244	6.18
Sanilac .....	27,483	181,967	6.62
Schoolcraft .....	22	108	4.91
Shiawassee .....	42,894	280,099	6.53
Tuscola .....	27,989	190,891	6.82
Van Buren .....	20,461	133,355	6.52
Washtenaw .....	79,059	576,432	7.79
Wayne .....	6,021	37,091	6.16
Wexford .....	1,761	12,022	6.83
Totals .....	1,260,295	8,207,594	6.51

By studying the above figures it will be seen that the ten counties producing the greatest amount of wool are Washtenaw, Eaton, Jackson, Calhoun, Lenawee, Ingham, Branch, Livingston, Oakland and Hillsdale, in the order named. These ten counties contain nearly one-half the sheep, and produce approximately one-half of the wool grown in Michigan. All the sheep raisers of Michigan know that the number of sheep in the above counties could be doubled without over stocking the farms of those counties. In other words, we believe if would be an advantage to the farms and a source of profit to the farmers were the present number of sheep in Michigan all grown in the ten leading sheep counties. We can easily see what a wide field there would be left in other sections of the State, equally adapted to sheep growing, for the development of the sheep and wool industry.

While the number of sheep and the amount of wool produced has suffered a great depression there has been a greater proportional falling off in the production of the finer grades of wool.

We are indebted to Michigan wool buyers for the following data concerning the present character and extent of the Michigan wool product.

Table showing amount and character of wool clipped from Michigan sheep during 1899.  
(The numbers over the columns refer to questions below the table.)

	1.	2.	3.	4.	5.
Allegan.....	100,709	98,209	78,029	11,256	31,281
Alpena.....	25,000	25,000	15,000	-----	-----
Arenac.....	1,700	1,700	1,430	50	35
Benzie.....	9,000	9,000	9,000	-----	-----
Berrien.....	50,000	49,000	50,000	3,500	29,200
Barry.....	268,000	268,500	200,028	74,308	65,083
Branch.....	364,500	345,900	196,939	73,458	182,025
Cass.....	337,600	324,000	337,600	39,070	126,550
Clinton.....	618,000	764,250	600,420	179,941	299,416
Calhoun.....	938,181	888,290	686,571	213,666	424,587
Charlevoix.....	1,000	1,000	960	50	750
Eaton.....	245,257	201,582	156,694	25,064	53,984
Emmet.....	3,500	3,500	3,500	1,750	-----
Grand Traverse.....	18,450	10,400	8,450	-----	-----
Graziot.....	213,000	210,250	172,300	15,950	82,750
Genesee.....	270,080	242,530	232,877	44,836	79,760
Huron.....	241,400	230,900	237,400	6,861	37,850
Hillsdale.....	672,742	523,792	865,608	320,801	227,130
Ingham.....	306,500	291,500	244,700	127,940	146,682
Ionia.....	251,800	140,400	231,600	34,890	69,790
Isabella.....	158,000	155,500	158,000	4,907	54,500
Iosco.....	9,000	3,000	8,700	300	150
Jackson.....	343,000	297,020	247,300	131,967	119,767
Kent.....	378,479	360,329	354,218	49,221	69,980
Kalamazoo.....	520,000	427,500	366,383	114,500	172,250
Lapeer.....	536,079	429,079	399,249	93,520	44,650
Lenawee.....	409,098	298,093	95,336	45,250	135,670
Livingston.....	548,500	371,300	430,880	143,291	236,841
Macomb.....	332,500	298,500	232,366	137,333	86,250
Monroe.....	82,146	82,146	72,146	-----	7,621
Mecosta.....	28,000	28,000	27,970	-----	600
Midland.....	8,000	8,000	7,840	-----	-----
Montcalm.....	275,500	294,100	260,140	73,925	106,025
Muskegon.....	150,000	150,000	150,000	-----	-----
Newaygo.....	36,350	19,114	20,800	5,360	3,267
Ottawa.....	40,800	40,800	29,040	4,000	7,160
Oceana.....	52,000	50,700	52,000	1,250	900
Osceola.....	69,341	64,360	64,841	2,250	5,900
Oscoda.....	12,000	11,000	12,000	2,400	-----
Oakland.....	506,000	430,000	386,190	133,800	318,733
Saginaw.....	210,712	150,162	180,310	7,796	47,350
Sanilac.....	211,900	189,900	201,879	18,130	38,076
St. Clair.....	158,500	140,800	150,596	6,855	44,708
St. Joseph.....	206,000	201,940	201,730	23,333	127,300
Shiawassee.....	277,000	263,250	199,250	73,916	115,666
Tuscola.....	317,891	257,200	264,353	22,849	79,846
VanBuren.....	120,120	99,946	120,120	10,000	46,810
Wayne.....	30,000	30,000	28,650	3,100	13,873
Washtenaw.....	952,562	573,562	685,416	478,856	396,085
Wexford.....	10,000	10,000	10,000	-----	3,500
Totals.....	12,025,802	10,242,124	9,696,446	2,606,615	4,069,844

QUESTIONS ASKED LOCAL WOOL DEALERS IN MICHIGAN.

1. How many pounds of wool have you purchased during the season of 1899?
2. How much of this do you think was produced in 1899?
3. How much of the wool you purchased was unwashed wool?
4. How many pounds of the wool you handle is nearly pure Merino?
5. How many pounds of the wool you buy is clipped before May 1st?

6. Is the percentage of the Merino wool you buy increasing or decreasing?
7. What is the most common fault with the preparation of the wool for the market?

A few points of interest should be noted from the above table.

First. That much more wool was purchased and reached the markets during the season of 1899 than was produced.

Second. Only about one-fifth of the wool marketed in Michigan was washed wool.

Third. Approximately one-fifth of the wool produced in Michigan is Merino or fine wool.

Fourth. Nearly one-fourth of the wool is clipped from Michigan flocks before May 1, showing that the practice of early shearing is much more common than formerly. A favorable condition which we are pleased to note.

It should be said, by way of explanation, that the totals opposite the different counties do not accurately represent the amount of wool produced in said counties. They mean that buyers in those counties purchased that amount of wool of the character indicated. The totals for the State can be relied upon, as well as the statements in regard to the condition of the wool marketed.

From reports sent in by local wool dealers it appears that only three counties in the State show an increase in the production of Merino wool. These counties being Emmet, Washtenaw and Eaton.

Six others, Midland, Mecosta, Iosco, Alpena, Barry and Clinton show neither an increase nor a decrease.

Thirty-three counties show a decided decrease in the amount of Merino wool produced. They are as follows: Arenac, Charlevoix, Grand Traverse, Osceola, Oscoda, Wexford, Allegan, Livingston, Macomb, Wayne, Gratiot, Huron, Isabella, Montcalm, Muskegon, Newaygo, Oceana, Monroe, Oakland, Ottawa, Shiawassee, St. Clair, St. Joseph, Van Buren, Saginaw, Sanilac, Tuscola, Berrien, Branch, Calhoun, Cass, Genesee, and Hillsdale.

Three hundred and fifteen replies were received from local wool dealers. We made an effort to get answers to our inquiries from every wool buyer in Michigan. Only twelve out of the three hundred and fifteen were satisfied with the condition in which Michigan wool reaches the market. Eighteen made no criticisms. Fourteen complained that sheep were poorly cared for, hence wools were not of strong fiber. Fifty-six said wools reaching them were poorly tied, objecting to coarse, heavy wool twine, binder twine and sisal. A very large per cent found fault with the presence of tags, chaff, burrs, dirt and other litter in the fleeces. Tags and chaff were most often mentioned. A total of two hundred forty-nine buyers complained of dirty fleeces, including as already said, tags, chaff and burrs.

With the vast amount of cheap unoccupied land in Michigan which is well adapted to sheep husbandry, combined with the present encouraging outlook for the wool and mutton industry, it is our opinion that farmers can well afford to double the number of sheep now kept in the State. Our climate and other conditions are favorable for the growth of wool and mutton and our geographical position gives us many advantages both from a breeder's and from a general farmer's standpoint.



## BREEDING FOR WOOL.

The present tendency of the wool market points to a continued active demand for fine grades of wool which the Merino alone produces. Michigan has long since proven her adaptability to the Merino. The Merino was brought to Michigan probably as early as 1828 and from that time until the beginning of the depression in the wool industry the Michigan Merino was well and favorably known all over the world. The successful breeding of Merino sheep is therefore assured; and if the adaptability of the Merino to Michigan's conditions is proven, and no one will deny it, then successful wool growing in Michigan cannot be questioned. We speak of the Merino, more particularly, in connection with the wool industry, because the Merino has always been recognized as the standard wool sheep of the world. The Merino has been bred and fed for the production of quantity and quality of fleece for generations.

A very large percentage of the wool produced in the United States is cross-bred wool. That is, of the wool reaching our markets, but a small percentage, relatively speaking, comes from pure-bred sheep, even if we take the total product from all the breeds of sheep having recognized registry associations into account.

The fleeces of wool which are graded by local dealers or commission men are seldom opened. The sorting process is a much closer and more accurate method of classifying wools. Before the wool is scoured it is generally sorted. The expert wool sorter opens the fleece and removes a portion of it here and there and throws it into separate piles or baskets. The number of sorts of wool in fleeces varies greatly, ranging from two or three to five or six sorts from the same fleece. It has been found that fleeces from pure-bred sheep do not, as a rule, have as many sorts of wool in them as those taken from grade and cross-bred sheep.

Fleeces uniform in quality and length of staple are most desirable for manufacturing purposes. Consequently if we wish to produce wools most desirable for the manufacturer we must not cross indiscriminately. We can use for the foundation stock of a flock, grade or native ewes and by systematic grading up with some definite breed of sheep we can produce a more even grade of wool throughout the fleece.

## MARKETING WOOL.

Unlike most other farm products, wool cannot be consumed on the farm. It is true that in the days of our grandmothers, and the spinning wheel, a large part of the then small wool product of the United States was manufactured and used upon the farm. Now all is changed. We neither spin the wool upon the farm, nor is it possible for us, when low prices prevail, to use up the surplus by feeding to our farm animals, thus converting it into meat products, as is possible with grains and hay produced upon the farm.

The question of wool markets and the preparation of wool for the market is therefore one of vital importance to the wool grower.

## PREPARATION OF WOOL FOR THE MARKET.

It is unfortunate that some of our wool growers think that there is little to be learned on this subject, while others consider it a matter of minor importance. On the other hand, we are glad to note that among the thoughtful progressive sheep men throughout the state there is a general awakening along these lines and a willingness shown to aid in an attempt to place Michigan wool on a par with the wool of any other state or country—a position which her wool is entitled to hold.

As a wool grower the writer has always wanted to find the real reasons why Michigan wools sell lower in the market than those from the states of Ohio and Pennsylvania. All who have studied the markets carefully, know that Michigan wools sell for from three to five cents per pound less for the same grade of wool than those grown in Ohio and Pennsylvania. They also know that there is no grade for Michigan wool above X, or to put it in another way, all wools grading X or finer, are graded as X and above, instead of making two grades, X, XX and above, as the grades are made for Ohio and Pennsylvania wools.

Those who are acquainted with the wools grown in the different states assure us that while perhaps the quantity of wool grading XX and above, is much greater in Ohio and Pennsylvania, yet there is a considerable quantity of our Michigan wool which does, in reality, grade XX and above. When it does possess the quality necessary to grade XX and above, it is not sold as Michigan wool but as Ohio and Pennsylvania.

If Michigan wool growers do not produce enough wool of the XX and above grade to warrant dealers to add such a classification to our Michigan wool quotations in the market, perhaps we must rest content for a time, but one thing is certain, those who produce such wool from Michigan flocks, should receive the Ohio and Pennsylvania quotations for such grades of wool instead of Michigan quotations for a grade of wool as low as X. The difference in price amounts to no inconsiderable sum in many instances.

That we might get some light on the subject of quotations of Michigan wools we addressed a series of questions to several wool dealers in the United States whose opinions, so far as they go, ought to be valuable.

We give below the questions and answers:

**Question No. 1.**—It is a very noticeable fact that the Michigan wools are not quoted as high in the market as those from some other states. Why is this? Is it due to the fact of inferior quality or is it because it is not so well grown and prepared for the market?

**Answer by No. 1.**—In our opinion the reason for the difference between the market value of Michigan wool and that from other states, as Ohio, for instance, is due to several causes; the inferior quality of breeding sheep, the wool not being so well grown or cared for or prepared for the market, many farmers being negligent in permitting their sheep to feed in hay or straw stacks or from hay racks. The climate also interferes with the proper growth and, in some measure, necessitates housing the sheep during the winter months and feeding them entirely upon grain, whereas, where the climate is propitious, they thrive better if allowed to graze on the farms.

Answers by Nos. 2, 3, 4 and 5.—Michigan wool is not so well grown nor is it so well packed as Ohio and Pennsylvania wools. The fleeces contain more vegetable matter such as seeds and chaff as well as a higher percentage of grease and tags. This makes the shrinkage greater and the grease value correspondingly less.

Answer by No. 6.—As all wools are sold on the basis of their scoured value, and as Michigan wools shrink heavier than those coming from Ohio, Indiana, Pennsylvania, Kentucky, etc., naturally, their grease price is lower. It is not on account of quality, but on account of condition. In other words, shrinkage of wool.

Answer by No. 7.—The reason Michigan wools are not quoted as high as Ohio and Pennsylvania is because, on the average, they are not as well bred, and the wool is heavier; the additional weight per fleece makes the compensation to the farmer equal to other states.

Answer by No. 8.—The value of all wool as marketed depends upon its intrinsic value, that is to say, the cost and quality of the scoured product when sorted and ready for manufacturing. The value of the scoured product is dependent upon first, staple; second, character; and third, quality. Michigan wools are not usually as uniform in grade, that is to say, as well bred nor as carefully put up as Ohio or Pennsylvania. The shrinkage is greater and therefore the market value is less.

Answer by No. 9.—One reason is, it is probably owing to the climate and feed that wools in the northern tier of states are not in all respects as good "working" wools as those grown further south; furthermore, the wools, as a rule, are prepared for the market in a less careful manner after being shorn.

**Question No. 2.—What is the most common fault in the preparation of Michigan wools for the market?**

Answers by Nos. 1, 2, 3, 4, 5, 7, and 9.—The most common fault in the preparation of Michigan wools for the market is that they contain seeds, tags stuffed inside the fleeces, and too much twine (mainly sisal) to which the manufacturers object strongly, as the sisal twine works into the goods.

Answer by No. 6.—We know of no general complaint as to the preparation of Michigan wools. They are in good favor and sell as well as any other stocks of equal condition.

Answer by No. 8.—As a rule Michigan wools are not as carefully washed as Ohio wools.

**Question No. 3.—What per cent of the Michigan washed wools are graded as unmerchantable? What is your opinion in regard to the advisability of farmers continuing the process of washing sheep?**

Answers by Nos. 1, 3, 5, 8 and 9.—In our opinion we think 10 to 12 per cent is about the amount of Michigan washed wools that are graded as unmerchantable. We are distinctly of the opinion that it is better for the farmers and for all concerned, to market the wool in an unwashed condition. Our experience of thirty years in handling Michigan wools has led us to this unalterable conclusion and we believe that the sooner the farmers adopt this universal practice, the better off they will be.

Answer by No. 2.—We usually figure, in the purchase of washed wool, an extra cent per pound, to allow for wool not sufficiently well washed.

Answer by No. 6.—It depends entirely as to the washing of the wool.

One lot might have thrown out only a very small percentage as unmerchable wool, whereas another might all be classed as of that condition. We do not think it advisable to wash wools, the unwashed being in better favor and selling more freely.

Answer by No. 7.—We cannot give a reliable estimate of the percentage of unmerchable as that grade is only made out of the fine washed wool, and the last year or two there has been a decrease in the proportion of fine washed wools.

**Question No. 4.—Is the practice as common as formerly? (Those who have tried it seem to favor shearing in April. If this is generally practiced washing sheep would be impossible. Would the argument against early shearing because of inability to wash sheep before shearing be a strong one?)**

Answers by Nos. 1, 3, 6 and 9.—The practice of washing is not as common as formerly, which is probably due to the low value ruling during the free wool period and the fact that the farmers have found that it was distinctly to their advantage to market their wool unwashed.

Answers by Nos. 2, 4, 5, 7 and 8.—The principal argument against early shearing, it seems to us, would be in the fact that the staple would be shorter.\* Ordinarily the Eastern wool market is a little higher in April than in June and July, and the early shorn wools command a better price in consequence. We are inclined to favor the practice of shearing unwashed, rather than washing.

**Question No. 5.—On account of the prevalence of ticks, lice and scab in many sections of the United States, dipping has become almost a necessity. Do you find that certain dips are detrimental to the fleeces or do they in any way lessen their value? If so, what dips ought a farmer to avoid?**

Answer by No. 1.—We have been considerably interested in the question of dips and have no hesitation in saying that a lime and sulphur dip is both injurious to the sheep as well as to the wool although it is very effective in killing ticks, lice and scab. In the extreme west, that is Wyoming, Montana, and Idaho, where the larger flockmasters have made dipping a special study, they incline to some form of tobacco dip, believing that it is less injurious to both the sheep and the wool and nearly as effectual as the lime and sulphur.

Answer by No. 2.—Dipping has become almost universal. A great many of the dips used are harmful for various reasons. Just exactly what dip to use we cannot say, but we know that there are some dips which hurt the wool and depreciate its value.

Answer by No. 3.—Avoid lime and sulphur.

Answer by No. 4.—Yes. All dips make the wool look dingy.

Answer by No. 6.—Some dips are very detrimental to the wool, setting their grease and making it impossible to scour them white. We, however, are not familiar enough with the different dips to recommend any particular class or kind.

Answer by No. 8.—We are not very familiar with sheep dips. We do not remember seeing any dipped wool that had not been injured in value by dipping.

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\* The staple would be no shorter if sheep were shorn in April each year.

Answers by Nos. 5 and 9.—Dipping of sheep is detrimental and depreciates the value of the wool more or less.

**Question No. 6.—Can you conceive of a dip being so compounded that it would be an actual advantage to the growth and condition of the wool?**

Answer by No. 1.—We cannot conceive of any dip being so compounded that it will be an actual advantage to the growth or the condition of the wool, except where the sheep are afflicted with ticks, lice, scab or some other skin disease.

Answer by No. 3.—Yes.

Answers by Nos. 4, 5, 6, 7 and 9.—No.

**Question No. 7.—Is the use of inferior twine and too much of it common enough to make it advisable to explain to wool growers the best grades of twine to use, the amount to use, etc.?**

Answer by No. 1.—The use of inferior twine, and too much of it, is certainly a great drawback to the marketing of Michigan wool, and under all circumstances should the use of sisal or binding twine be avoided. as manufacturers discriminate strongly against fleeces tied up in this manner, as the vegetable substance gets into the yarns and ruins them unless the wool is carbonized. The latter process takes the life out of the fiber and also weakens it, hence carbonized wool is only used in inferior fabrics. We think six to eight feet of twine, such as the sample herewith enclosed, is sufficient to tie the wool in such manner that the fleeces can be marketed in good shape.

Answer by No. 2.—It is advisable for the grower to use as little twine as possible, and such twine should be of the best grade. It should simply be wound round the fleeces once.

Answers by Nos. 3, 4, 5 and 9.—Yes.

Answer by No. 6.—A small hard round twine should be used, tying up the fleeces once across each way, the same as you would tie up a box, not using any more twine than is actually necessary. A thick fiber twine is very detrimental and most especially that called sisal.

Answer by No. 7.—The use of inferior twine is a disadvantage.

Answer by No. 8.—The use of sisal twine is a very serious injury to wool, and causes such damage in certain kinds of manufacture that manufacturers are obliged to use foreign wools to escape the risk of damage to their goods. If your efforts can prevent the use of sisal twine throughout the state it will make one step towards popularizing Michigan wool.

**Question No. 8. Some have advocated that wool should not be tied up in a wool box but should simply be partially folded and rolled up. Do you think that wool so put up would reach the market in as good shape as wool put up in a wool box large enough so that the wool is not compressed enough to make it appear heavy?**

Answer by No. 1.—The use of the box we think is detrimental as it causes too great a density to the fleece, and hence in estimating the shrinkages manufacturers are liable to put their figures too high, which of course is to the disadvantage of the farmer. We think that if the fleeces were properly tied, as is the case in most sections of Ohio, they would reach the market in as good shape as wool put up in a wool box.

Answers by Nos. 2, 5, 6 and 8.—We do not believe it necessary or advisable to tie wool up in a wool box, but it should be simply folded and then tied with a light, strong twine. We think this method still better than by tying them up in a box. In fact, some dealers refuse to take wools so tied.

Answer by No. 3.—Tie it up so as to use the least twine.

Answer by No. 4.—No material difference.

Answer by No. 7.—The proper twine to use is hard smooth hemp twine, tied around the fleeces once each way.

Answer by No. 9.—We think tying fleeces in a box is bad policy.

**Question No. 9.—Could you suggest any method of tying up wool, not now generally practiced in the United States which would be advantageous for our wool growers to adopt?**

Answer by No. 1.—The only method we could suggest in tying up fleeces properly is to carefully turn in the belly and roll up the fleece, wrapping the twine three ways. Our experience has taught us that, unless the wools are stuffed, very little of the fleece is lost in handling.

Answer by No. 2.—If the growers would tie up the wool by simply folding it, and then use strong twine round the fleeces once, it would, in our opinion, be as good as anything.

Answer by No. 3.—Abroad they do not tie up the wool as a rule.

Answer by No. 4.—No.

Answer by No. 5.—Australian way, with two small strings only.

Answers by Nos. 6 and 7.—The only correct method is to roll up the fleece and tie as stated above.

Answer by No. 9.—Fleeces should be tied sufficiently with fine, strong twine to hold them together and that is all that is necessary.

**Question No. 10.—Are the paint marks used quite generally by farmers to identify their sheep a source of much loss to the producer?**

Answer by No. 1.—Paint marks are a detriment to the marketing of wool and hence should be avoided wherever possible, and we think this should be easy enough where wools are grown as they are in Michigan, fences separating different farmer's flocks.

Answer by No. 2.—If the growers could get some other means of identifying their sheep, other than paint, it would appreciate the value of wool, as the portion of wool covered by paint is practically worthless.

Answer by No. 4.—Not in Michigan.

Answer by No. 5.—They are in every way. It has to be all broken out and put into the low grade or stained sort.

Answer by No. 6.—Where the sheep are marked with paint or tar it has to be clipped out by the sorters before scouring and causes considerable expense and loss.

Answer by No. 7.—About paint marks, it is necessary for farmers to mark their sheep in some way, but under no condition should they use paint that has any mixture of tar, as it is absolutely impossible to extract the tar from the wool, even after it gets into goods.

Answer by No. 8.—Paint marks are a disadvantage in any wool, and for some classes of yarn the clips containing the paint marks cannot be used at all. It would be an advantage to the grower to clip off the paint marks before shearing the sheep.

Answer by No. 9.—Of late years we see no paint marks on sheep raised east of the Mississippi which are objectionable.

**Question No. 11.—In shearing, a novice often makes second cuttings; could you give anything like an approximate estimate of the per cent of fleeces injured by improper shearing?**

Answers by Nos. 1, 2, 6, 8 and 9.—It is impossible to give the percentage of fleeces injured by improper shearing.

Answers by Nos. 3 and 4.—No.

Answer by No. 5.—It (the short clips), is not worth much, cannot give estimate.

Answer by No. 7.—The second cuttings you speak of as an incident of green hands shearing is an infinitesimal amount.

**Question No. 12.—In your judgment what grade or grades of wool are likely to return to the producer the best profits in the next few years?**

Answer by No. 1.—It is almost impossible to definitely form an opinion as to the grades of wool which are likely to return to the producer the best profits in the next few years, as everything depends upon fashions in woolen goods, and no one can determine in what direction they will lean.

Answer by No. 2.—This is a difficult question to answer, as the grades used depend upon the fashion. Manufacturers make such goods as they can sell, and buy wools which are essential to the making of such goods.

Answer by No. 3.—Fine wool will profit the grower, but medium wool is more profitable.

Answer by No. 4.—Varies with each season's fashion.

Answer by No. 5.—If I knew I would buy all that kind.

Answer by No. 6.—The grades known as "1-4 and Medium" in our judgment are those most likely to be in demand and to command higher prices within the next year or two.

Answer by No. 7.—To your question as to our opinion as to the grade of wool that will pay the producer the next few years, we would say that the producer is the best judge of that, as the value of the mutton carcass enters largely into the profit of sheep industry.

Answer by No. 8.—In all wool growing sections of the world it has become apparent in recent years that wool could not be raised for the fleece alone with profit. In South America the breeding of mutton sheep has increased until now about 70 per cent of the clip which formerly was all Merino, is all English or cross-bred wool. Practically the whole of the New Zealand clip is from English or cross-bred sheep, and the increase of mutton sheep is growing in other parts of Australia. The duty may give the growers of Merino wools here for a while an opportunity to produce wool profitably, particularly in view of the decrease in the production of Australia and South America, but we think eventually it will be found that the wool grower will have to market the carcass as well as the fleece, and that mutton sheep, with a long stapled fleece, as fine as possible, will prove the most profitable to raise, say from 1-2 to 3-8 grade.

Answer by No. 9.—Impossible for us to give an opinion.

Answer by No. 10.—In a general way Michigan wool is undesirable because, partly from carelessness and partly from intent, the wool is

not carefully bred, is not properly skirted, is tied with the heaviest and worst twine possible, and is very apt to be filled with chaff and seed. The paint you speak of is a decided objection, but is not a peculiarity of Michigan, but pertains to most wools.

Washing the sheep, unless done much more carefully than has ever been done in your state, is a half-way measure at best, and for that reason we think it would be wiser to have it all marketed unwashed.

The box method of packing is undesirable. The fleece, after being properly freed from tags, bad skirts, and undesirable matter of all kinds, should be lightly folded and tied with as light twine and as little of it as is possible. In our judgment the amount of twine used should not cover one-fifth or one-tenth part of what is commonly used. Sisal twine should be absolutely prohibited. It actually injures the value of the whole fleece.

The following firms are the ones who were kind enough to answer the above questions. For convenience we have designated their answers by number.

- No. 1. Fenno Brothers & Childs, 562 Atlantic ave., Boston, Mass.
- No. 2. Hecht, Liebmann & Co., 211-217 Federal st., Boston, Mass.
- No. 3. Jeremiah Williams & Co., 105 Federal st., Boston, Mass.
- No. 4. Hallowell, Donald & Co., 556 Atlantic ave., Boston, Mass.
- No. 5. East Weymouth Scouring Mill, East Weymouth, Mass.
- No. 6. Chas. J. Webb & Co., 116 Chestnut st., Philadelphia, Pa.
- No. 7. Louis S. Fiske & Co., 34 So. Front st. and 35 Letitia st., Philadelphia, Pa.
- No. 8. Mauger & Avery, 564 Atlantic ave., Boston, Mass.
- No. 9. Denny, Rice & Co., 606 to 610 Atlantic ave., Boston, Mass.
- No. 10. Whitman, Farnsworth & Thayer, 118 Federal st., Boston, Mass.

While there seems to be some difference of opinion in regard to minor points, and while the writer could not, in all instances, agree to some statements made,—it will be noticed that there is a general uniformity of opinion that Michigan wools might be,—(1) Better grown and (2) More carefully prepared for the market.

The sooner we, as wool growers, fully appreciate the difference in value to the manufacturer of wools well grown and poorly grown, the sooner will all our wools command a better price.

We must banish forever the idea that condition, quantity, quality and length of staple are all of the important factors affecting its value. But we must give more attention to the growing of wool fibers of great strength. Strength of the wool fiber depends, to a considerable extent, upon the quality of wool or the size of the fibers. The important point, however, in this connection, which we wish to emphasize at this time, is that there is a great difference in the relative strength of fibers of the same quality or grade of wool. When a difference of this kind exists it is largely due to the way it has been grown.

The strongest fiber of wool is produced on sheep when the animal has been supplied with an abundance of nourishing food, at all times throughout the year.

If, on the contrary, a sheep is poorly nourished the strength of the wool fiber will sooner or later be seriously affected. If proper care is not continuous throughout the year, and the flock is neglected during



some particular period, then a break in the fiber occurs, which greatly weakens the fiber at that particular point. The strength of the weakest place in the fiber decides the strength of the whole fiber.

So far as the writer has been able to discover there is no special ration, which, if fed to sheep, will produce wool of great strength, nor can we, at any time, say that any special ration is to be recommended to produce a large quantity of wool. It has often been observed that sheep and lambs that have been on full feed for long periods shear heavy fleeces of wool. This would indicate that any ration calculated to keep the sheep in a thrifty condition would be a suitable one for growing large quantities of wool.

From what we have said above, the wool grower will understand that it is highly desirable to provide the sheep proper nourishment throughout the year, permitting no periods of neglect to intervene to destroy the strength of the fibers of the fleece. Liberal and judicious feeding does not change the quality of the wool but it does affect the strength and the quantity of the wool produced by a given sheep.

The weight of wool produced is affected both by increasing the length of fiber and by increasing the amount of yolk and natural oil in the fleece.

## MANAGEMENT OF THE FLOCK IN ITS RELATION TO CONDITION OF WOOL.

The condition of the wool refers to the cleanliness of the fleece,—the absence of all foreign substances, such as sand, burrs, chaff and all other substances looked upon by the wool manufacturer as litter.

It is not because these naturally light substances affect the weight of the fleece to any considerable extent, that the wool manufacturer so strenuously objects to their presence in the fleece, but that they must be removed from the fleece before it is ready for manufacturing purposes and the process of separating these substances from the fleece is not only very tedious but very expensive, and that, as a rule, it cannot be done without more or less injury to the wool fiber. Knowing the above facts we can easily see how condition affects the price of wool, because it directly affects its value.

It is not a difficult matter for the wool grower to so manage his flocks that the wool produced by them will be practically free from all litter. He must provide racks for the sheep which will permit them to eat without getting their necks full of chaff, seeds and dust. (It is of course, unnecessary to mention the old straw stack.) He must keep his farm free from burr-bearing weeds, his flock will keep most other weeds in check. If we needed any proof that the farmers of our country are negligent about allowing weeds to grow and seed in abundance on their farms, we could visit some large wool scouring or woolen mill and carefully examine the refuse or waste from the mills and we would have abundant proof in the millions of weed seeds found. At some mills where such refuse is dumped where seeds can germinate and grow we find a large number of species and varieties of weeds.

## UNIFORM PRICES FOR MIXED LOTS OF WOOL.

Another factor in the marketing of wool by growers is that many insist on getting a uniform price for their wool even though they may produce several grades of wool differing much in their value to the manufacturer. Suppose the local dealer tries to purchase this wool upon a basis of its value, he must then pay different prices per pound after he has made an approximate estimate of the amount of the different grades of wool in the lot. If the producer insists on getting a uniform price for the entire clip, the dealer must determine what a safe average price would be. You may think that this makes little or no difference to the producer. We believe it makes a very material difference; first, because the dealer is pretty sure to strike under rather than over the exact average price he could afford to pay to be sure to save himself; second, since this is a general practice in Michigan, the grower seldom has an opportunity to learn which are the most valuable fleeces and why. There is, consequently, little chance or hope for improvement so long as this state of affairs continues. Local dealers have more opportunity for learning the details of the wool business and we think would be willing to impart information to producers of wool if said producers would manifest a desire to learn and improve their methods in growing and handling their wools.

Your local dealer, if he buys wool on its merits and pays what your wool is worth, should have the privilege of handling your wool. "Commission buyers" are always ready to pay a uniform price for your wool because they are paid so much per pound for buying wool, but rest assured when they pay a uniform price they are keeping within a safe average price limit. Wool growers need to become more familiar with the trade. It is unfortunate that many Michigan sheep owners, who keep small flocks, must compete with other sections of the country where large flocks are kept producing a large amount of wool of a uniform grade. These large clips of a uniform grade are more sought after by manufacturers than many small clips that are apt to vary more or less. This suggests the desirability of Michigan wool growers making an attempt to produce a uniform grade of wool in some sections of the state. Buyers and manufacturers desiring the grade of wool produced will soon learn where they can pick up a large amount of wool suitable for their particular purpose. The grade of wool produced is not so material as that it be uniform.

That we might get more definite information concerning the wool produced by the various breeds of sheep, more or less common in the United States, we tried to secure a ewe's and a ram's fleece of each of the breeds, which should be an average typical fleece of the breed. In most cases we were successful in securing what we desired, but in other instances we were not fully satisfied that the fleeces submitted were typical of the breed.

In examining the tabulated facts below we make the request that the reader should not consider the figures there exhibited as settling the relative merits of the various breeds as wool producers. Certain general conclusions may be drawn from the table but it must be obvious to every thoughtful reader that it would be very nearly impossible to secure two fleeces which would in every way be representative of the various breeds.

Table showing Weight of Fleece, Per Cent of Shrink, Commercial Grade, and Price per Pound of Fleeces from different breeds of Sheep.

Breed.	Sex.	Age, years.	Weight of fleece in grease.	Weight of fleece after scouring.	Per cent of shrink.	Commercial grade.	**Price per pound in grease before scouring.	**Price per pound after scouring.
16 American Merino.....	Ewe.....	3	17 $\frac{1}{2}$ 12 oz.	4 $\frac{1}{2}$ 14 $\frac{1}{2}$ oz.	72.36	X Clothing.....	80.14	80.50
17 American Merino.....	Ram.....	4	26 12 $\frac{1}{2}$	6 10 $\frac{1}{2}$	75.15	XX Clothing.....	13	52
27 National Delaine Merino.....	Ewe.....	4	9 10	5 11	87.79	Fine Delaine.....	21 $\frac{1}{4}$	51
39 Improved Black Top Merino.....	Ram.....	1	18 11 $\frac{1}{2}$	5 11	69.64	Fine Delaine.....	20	66 $\frac{1}{2}$
30 American Rambouillet.....	Ewe.....	2	8 1 $\frac{3}{4}$	3 9 $\frac{3}{4}$	55.42	X Clothing.....	20	41 $\frac{1}{4}$
31 American Rambouillet.....	Ram.....	1	7 15	4 9 $\frac{1}{2}$	44.19	Fine Delaine.....	22	39 $\frac{1}{4}$
25 *Cross Bred.....	Ewe.....	1	11 1	4 5 $\frac{1}{2}$	60.73	$\frac{1}{4}$ Clothing.....	19	46 $\frac{3}{4}$
35 Southdown.....	Ram.....	1	7 5 $\frac{1}{4}$	3 4	55.75	$\frac{1}{4}$ Combining.....	22	50
36 Southdown.....	Ewe.....	1	7 1	3 8 $\frac{1}{4}$	50.00	$\frac{1}{4}$ Combining.....	23	46
33 Southdown.....	Ewe.....	3	7 12	4 11 $\frac{1}{4}$	39.11	$\frac{1}{4}$ Combining.....	23	37 $\frac{3}{4}$
24 Shropshire.....	Ewe.....	1	10 12	5 9	48.25	$\frac{1}{4}$ Combining.....	22	42 $\frac{1}{4}$
26 Suffolk.....	Ram.....	1	6 15 $\frac{1}{4}$	3 8	56.95	Low $\frac{1}{4}$ Combining.....	23	53 $\frac{1}{4}$
29 Hampshire.....	Ewe.....	3	9 6	5 4 $\frac{1}{2}$	43.67	$\frac{1}{4}$ Combining.....	23	41
18 Oxford Down.....	Ewe.....	3	12 9	7 13 $\frac{1}{2}$	37.56	Braid Combining.....	20	32 $\frac{1}{4}$
23 Oxford Down.....	Ewe.....	3	15 2	8 13 $\frac{1}{2}$	41.53	$\frac{1}{4}$ Combining.....	19	32 $\frac{3}{4}$
42 Leicester.....	Ram.....	+10	12 8 $\frac{1}{4}$	8 5 $\frac{1}{2}$	33.33	Low $\frac{1}{4}$ Blood.....	19	29 $\frac{1}{4}$
32 Cotswold.....	Ram.....	+2	15 3	9 13	35.39	Coarse Combining.....	19	29 $\frac{1}{4}$
33 Cotswold.....	Ewe.....	1	12 3 $\frac{1}{4}$	7 12	36.57	Braid Combining.....	19	30 $\frac{1}{4}$
34 Lincoln.....	Ram.....	+11	14 8 $\frac{1}{2}$	10 4 $\frac{1}{2}$	33.77	Braid Combining.....	20	31 $\frac{1}{4}$
40 Lincoln.....	Ewe.....	1	14 11	10 2 $\frac{1}{2}$	30.86	Braid Combining.....	20	29
43 Tunis.....	Ewe.....	+11	8 12 $\frac{3}{4}$	4 5	43.75	$\frac{1}{4}$ Combining.....	23 $\frac{1}{4}$	39 $\frac{1}{4}$
19 Dorset Horn.....	Ewe.....	2	6 12 $\frac{1}{4}$	4 1	40.09	$\frac{1}{4}$ Combining.....	23 $\frac{1}{4}$	37
20 Dorset Horn.....	Ram.....	1	8 2 $\frac{1}{4}$	4 4 $\frac{1}{2}$	47.51	$\frac{1}{4}$ Combining.....	22	42 $\frac{1}{4}$
37 Dorset Horn.....	Ewe.....	2	8 15	4 10 $\frac{1}{2}$	47.90	$\frac{1}{4}$ Combining.....	22	42 $\frac{1}{4}$
41 Dorset Horn.....	Ram.....	+13	9 1 $\frac{1}{4}$	4 14 $\frac{1}{2}$	46.04	$\frac{1}{4}$ Combining.....	22	40 $\frac{1}{4}$
28 Cheviot.....	Ewe.....	2	9 2	6 10	27.39	$\frac{1}{4}$ Combining.....	23 $\frac{1}{4}$	31
21 *Cross Bred.....	Ewe.....	1	7 4	4 4	41.38	$\frac{1}{4}$ Combining.....	21 $\frac{1}{4}$	24

\*\* Prices quoted Aug. 31, 1899.

† Months old.

\* Hampshire and Cotswold.  
† Rambouillet and American Merino.

That there might be absolute fairness in securing representative fleeces of each breed, the writer appealed to the secretaries of the various sheep breeders and registry associations to aid in securing the fleeces. In most instances much valuable assistance was rendered.

The weight of all fleeces is computed upon the basis of 365 days growth.

Fleeces number 16 to 27, inclusive, were furnished by the Michigan Agricultural College.

The remaining fleeces were furnished by the following well known breeders:

28. H. H. Keim, Ladoga, Ind.
29. W. C. Smith, Washington, Mich.
30. L. B. Townsend Estate, Ionia, Mich.
31. L. B. Townsend Estate, Ionia, Mich.
32. George Harding & Son, Waukesha, Wis.
33. George Harding & Son, Waukesha, Wis.
34. Robert Knight & Son, Marlette, Michigan.
35. Jermone Leeland, Springfield, Ill.
36. Jermone Leeland, Springfield, Ill.
37. George C. Woodman, Manistee, Mich.
38. Mrs. Virginia C. Meredith, Cambridge City, Ind.
39. L. L. Harsh, Union City, Mich.
40. J. J. England, Caro, Mich.
41. George C. Woodman, Manistee, Mich.
42. John Marshall, Cass City, Mich.
43. Chas. Roundtree, Youngsville, Ind.

We are indebted to E. Frank Lewis, Lawrence, Mass., for scouring the above fleeces and giving us the data.

For the benefit of those who may not understand fully what is meant by the terms used in the column headed "Commercial Grade," we will make a few brief explanations.

All domestic wools may be classified according to their quality, strength, and length of staple as (1) Clothing or carding wools; (2) Combing wools; (3) Delaine wools.

Clothing wools are short wools and incidentally of relatively fine quality. In a general way all wools less than two and one-half inches in length are clothing or carding wools.

Combing wools are both long in staple and strong. Most of the coarser long wools are graded as combing wools. However, when a wool is long enough for combing and has the necessary size of fiber it may still be disqualified as a combing wool if it has been poorly grown. Breaks in the fiber caused by insufficient nourishment destroy the value of wools for combing purposes.

Delaine wools are fine wools clipped from all varieties of Merinos or high grade Merinos which grow wool of long, strong staple. We might say that Delaine wools are combing fine wools.

Each one of the three classes of wools above mentioned are subdivided according to quality or size of fiber, as follows:

Clothing wools	{ Picklock
	{ XXX
	{ XX
	{ X
	{ No. 1 or $\frac{1}{2}$ blood
	{ No. 2 or $\frac{1}{4}$ "
	{ No. 3 or $\frac{1}{8}$ "

Combing wools	$\left\{ \begin{array}{l} \frac{1}{4} \text{ blood} \\ \frac{1}{2} \text{ blood} \\ \text{Coarse or common} \\ \text{Braid} \end{array} \right.$
Delaine wools	$\left\{ \begin{array}{l} \text{Fine} \\ \text{Medium} \\ \text{Low} \end{array} \right.$

Picklock is a grade that is rarely found in the markets at the present time. Formerly there was quite a large quantity of this wool reaching our markets. The wool from pure Saxony Merino sheep usually grades Picklock. XXX is also hard to find. When the Saxony Merino was crossed with the common American or Spanish Merino the cross-bred resulting usually produced wool grading XXX.

XX is considered the standard for a pure bred Merino.

Some three-quarter blood Merino, nearly all of the high grade Merino and much of the coarser pure blood Merino wools, grade as X.

The terms 1-2, 3-8 and 1-4 blood do not necessarily mean that the wools were grown on sheep possessing just that fraction of Merino blood. Many sheep containing no Merino blood grow wool grading 3-8 and 1-4 blood. No. 1 or  $\frac{1}{2}$  blood is the next coarser grade than X. No. 2 is coarser than No. 1, and so on.

Coarse and Braid wools are invariably combing wools and are the grades most frequently produced by Lincolns, Leicesters and Cotswolds, which have fleeces coarse and long in staple but bright and lustrous.

Fine Delaine wool is Merino wool fine enough to grade X or above and long in staple.

Medium Delaine is the grade next coarser than the above, while Low Delaine is long enough to be Combing, but a grade finer than the finest Combing wools, namely, 3-8 blood.

Other grades of wool which are occasionally quoted in the markets are felting wools and noils.

By our request Mr. Chas. F. Avery, of Boston, defined felting wools and noils as follows:

"Felting wools are wools which are adapted for felting purposes, usually of short staple, and having properties which cause them to felt quickly. We presume that you understand that felting is a process whereby the fibers are interlocked in such a way that a solid fabric is produced without the intermediate processes of spinning and weaving.

Noils. In the process of combing wool the fibers are drawn between fine needles and the dead and tender wools are broken off in the process and produce what are called Noils, or what might be called Combing Waste. The long and healthy fibers are carried along through the combing process and are formed into what are called Worsted Tops."

### WASHING SHEEP.

As has been stated elsewhere in this Bulletin, washing sheep is not nearly so prevalent as formerly. Most manufacturers agree that wool which has been washed in the country is not as desirable as that which has been sent to market unwashed. It is an unsatisfactory process at best, and many times the country washing makes scouring at the mills more difficult.

## SHEARING AND WASHING.

After a careful investigation of the subject we are convinced that, in the long run, it is more profitable to dispense with washing altogether.

We have secured better results by shearing our sheep during the first half of April than later in the season. This, of course, makes it impossible to wash sheep before shearing. We are satisfied that we can get, not only a heavier average fleece, but also a wool of better strength from the same flock by shearing during the first half of April than by shearing in May or June.

If reasonable care is taken to keep the wool free from dirt and litter while on the sheep's back then there is little to be gained by washing. By an examination of the wool market quotations we note a class of unmerchantable wools. This class includes wools poorly washed. A large per cent of our Michigan washed wools are sold as unmerchantable, at a price about equal to that of unwashed wools.

We should not leave this subject of washing without saying that if we could think the washing process an advantage to grower and consumer alike we would still think the custom of doubtful utility on account of injury to the sheep. Sheep are often roughly handled and not infrequently we believe more injury is done to the sheep than good to the fleece. The sheep will suffer no inconvenience from early shearing except for the first few days, if they are properly sheltered and protected from the cold and more especially storms. The wool makes a rapid growth during the cool months of spring and the sheep is not sweltering under a thick blanket of wool. In the latter case the sheep is not only uncomfortable, but the wool makes but little if any growth.

For several years, in a majority of instances, the Eastern wool markets have been better in April than in June. This would give the grower, who makes a practice of early spring shearing, a slight advantage as to markets.

## SHEARING SHEEP.

The best job of shearing is that which secures the largest amount of wool in the best condition for market without injury to the sheep. It is highly desirable that the sheep be closely shorn and that there should be no second cuts. The fleece should be kept intact, not torn apart, and the skin of the sheep should not be wounded.

Nearly all of the sheep east of the Mississippi river are shorn by hand, while many in the west and on the ranges are shorn with machines.

Thinking that many of our readers would be interested in the practical workings of the shearing machine for small flocks we addressed several questions to men who have used the shearing machines and are competent to speak of the advisability of their general adoption on Michigan farms. We are indebted to the following gentlemen for replies:

1, John MacQueen, Kirkland, Ill.; 2, J. E. Wing, Mechanicsburg, Ohio, and 3, Coffland & Lybrand, Richland Center, Wis.

The questions and answers follow:

**1st. Would you advise a man owning fifty to one hundred sheep to have anything to do with any make of shearing machine?**

Answer by No. 1.—I would not advise any one to buy a machine for fifty or one hundred sheep.

Answer by No. 2.—Wait. Some day they will be practical.

Answer by No. 3.—We would not advise a man owning fifty to one hundred sheep to purchase a sheep shearing machine for these reasons: The expense is greater than with shears. Two men not being able to shear more than one man can with shears. They are almost continually out of repair. Knives are very easy to dull and in order to sharpen them have to be forwarded to the factory.

**2d. What are the advantages to be gained by using a sheep shearing machine?**

Answer by No. 1.—The advantages of using a sheep shearing machine are that one gets from three-quarters to one pound of wool more from each sheep and leaves them nice and smooth, fit to put on the market in one-half the time hand sheared sheep are. Also, that one can get inexperienced men to run machines when practical men cannot be found, which is often the case.

Answer by No. 2.—They do far better work. Don't cut the sheep. Take off the wool smoothly.

Answer by No. 3.—The advantages to be gained are that they leave the carcass in nice even shape and do very little cutting. The fleece is also in good shape, no double cutting to speak of.

**3d. What are the disadvantages?**

Answer by No. 1.—There are no disadvantages in using sheep shearing machines—in fact, I would not be without them for twice their cost.

Answer by No. 2.—Leave the sheep exposed to flies. Also they get dull and you cannot sharpen the knives, must send to factory.

Answer by No. 3.—The disadvantages are as described above.

Another party, who did not care to have his name used, stated that, in his experience he had found that he could get from one-half to nearly a pound more wool per sheep with machine shearing than with hand shearing. "It depends considerably upon the kind of sheep you are shearing. With the heavier pelted and wrinkled sheep we can take off considerably more than with the coarse woolled. This extra wool would about pay for the shearing in ordinary cases. There are no disadvantages in using the machines. It helps the appearance of the sheep, and, in my experience, I have found nothing detrimental in their use. It is only a matter of the machine's being used properly by the operator. Should it not be properly handled the chances are that the wool would be cut twice, the same as it is in hand shearing."

We submit a cut below which exhibits a remarkably good job of hand shearing. The wool is closely clipped, leaving a smooth even surface.

### TYING UP OR PACKING WOOL.

It will be observed that, almost without exception, commission men and wool dealers agree that one of the greatest faults, if not the greatest fault, of Michigan wools lies in the way they are tied, or prepared for the market. To sum up the objections they would be something as follows:

1. Either by neglect or intent tags and litter are often incorporated in the fleeces.

2. Too much twine of an inferior grade is used.

3. The use of the wool box, which packs the fleeces into a square bundle that is too compact.

Let us consider these objections. If we understand tags to refer to bunches or locks of manure which have accumulated on small bits of wool about the thighs and hocks, then we should say by all means they should be left out of the fleece, and either sold separately, as tags, for what they will bring or used as manure. We have known breeders of fine wool sheep who have thoroughly washed and dried the tags and then put a handful or so in each fleece. There is no great objection to this, providing the tags are well washed and thoroughly dry. We believe, however, that it would be more businesslike to sell the washed tags sepa-

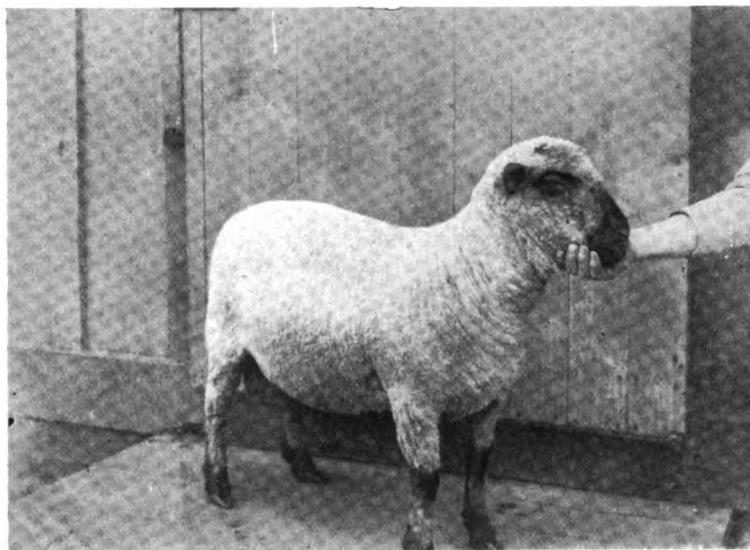


FIGURE 1.

ately as the wool will never be as valuable as the rest of the fleece. We believe it perfectly legitimate to tie up all the wool that grows on the sheep in the fleece, provided that the wool is free from all foreign substances which would add to the natural weight of the fleece.

May we venture here to offer one reason why a majority of wool growers incorporate tags and litter in the fleeces which they sell? There are two distinct classes of growers who put tags into the fleece. The first class includes growers who put tags into the fleece either through absolute carelessness or with the evident intent of deceiving the buyer. For such we have no sympathy and we have reason to believe this class of men small. The second class includes growers who are progressive and business like. This statement sounds inconsistent, but it is not. These men have cut out tags and litter very carefully, it may be for two or three years, they have observed that, as a rule, they get no more for their



wool than the men who put tags and all into their fleeces. This suggests that buyers are not careful enough in recognizing careful painstaking methods on the part of the progressive growers. Buyers know the extra value of clean wool. Let them encourage the honest, painstaking growers in a substantial manner by giving more per pound for their wool, a thing which they can well afford to do. Let them, at the same time, discriminate against wool carelessly tied, or that contains chaff, burrs and other litter. Until buyers rigidly adhere to the above policy there can be but little improvement expected among wool growers.

The second and third objections are so closely associated that it is difficult to separate the two in a discussion of them. If the reader has carefully read the foregoing pages he will have a very definite idea in regard to the way the local dealers, commission men and manufacturers consider the present methods of Michigan growers in tying up their wool.

That we might get at the question from the growers' standpoint as well as the dealers' we addressed the following question to a number of prominent wool growers: **Is there anything any better than a good, large wool box in which to tie up fleeces in preparing them for market?** "No. We do not think any way of tying adds much if the fleece is kept entire and clean. It can be tied on the floor with one string." "Our buyers object to the wool box and we roll up the wool and use as little twine as possible."

The above answers are characteristic of all received.

We made a careful canvass of the State and found that a great majority of the wool growers use large twine, using to aid in the process of tying a square wool box.

We have consulted no less than a dozen of the leading Boston wool buyers and every one is prejudiced against wool tied with the common coarse twine, and radically so when tied with sisal twine. The most of our Michigan wools reach the manufacturer through Boston commission houses, and if they object to the twine we use, and pay less for our wool on account of it, it is time for us to make a change. The eastern wool houses do not object to coarse twine without reason. In the first place it is not business for wool growers to tie up a fleece with a coarse heavy twine when a small twine will do as well. It is not right to attempt to sell a lot of twine at from fifteen to twenty-five cents per pound which only cost five or six cents per pound. We give below a cut which illustrates very nicely the point we are trying to make.

The long coarse twine at the right was taken from a nine pound Shropshire fleece done up in the ordinary way in a square wool box.

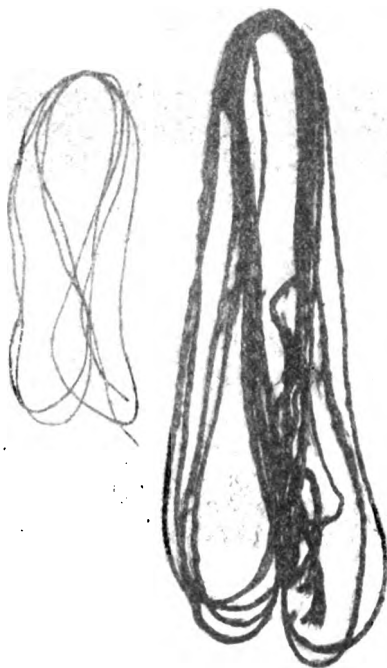


FIGURE NO. 2.

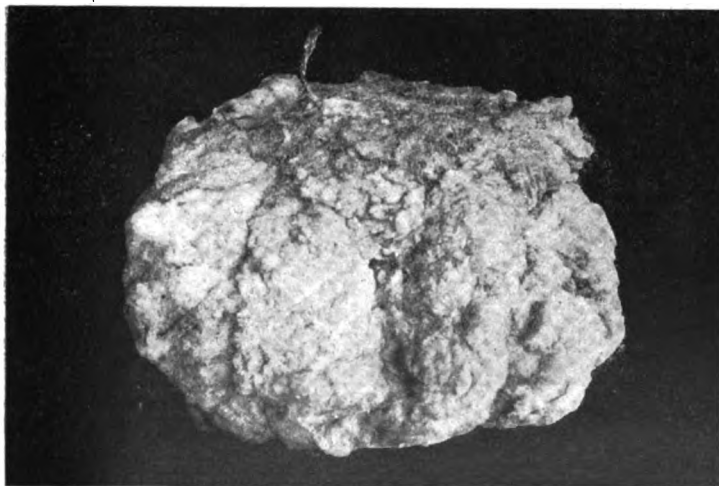


FIGURE NO. 3.

Fig. No. 3 shows a photograph of the fleece. The twine measured just

twenty-four feet. The small short twine shows the amount of twine necessary to tie the same fleece by folding without any box and putting one string round each way.

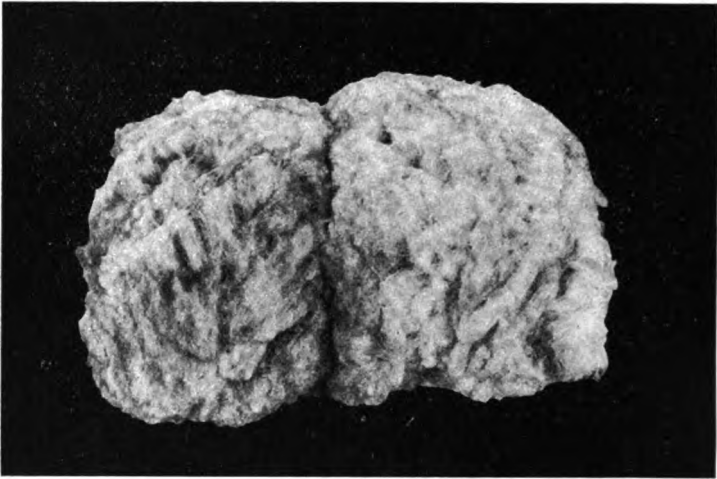


FIGURE NO. 4

Fig. No. 4 shows the fleece tied with the fine twine or string once

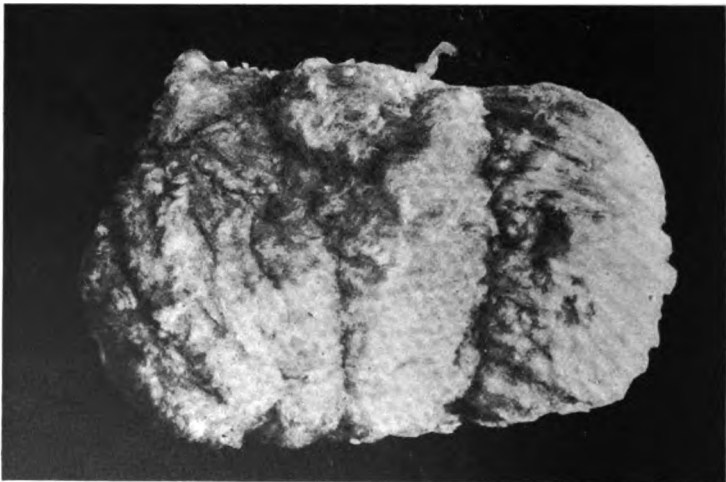


FIGURE NO. 5

around each way. Fig. No. 5 represents an eighteen-pound Oxford fleece

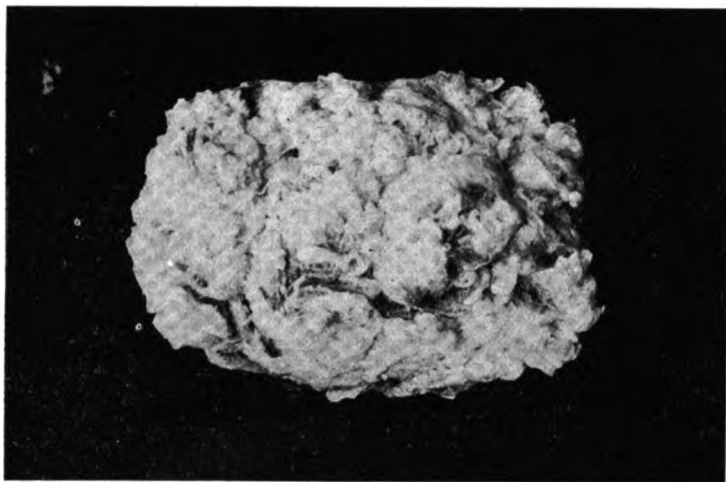


FIGURE NO. 6.

tied in a square wool box and Fig. 6 a twelve-pound Delaine Merino fleece tied in the same way. Besides weight there is still another reason why buyers object to coarse twine. The coarse, hard fibers of the twine are apt to work in among the wool fibers. Manufacturers find it difficult to separate these foreign fibers from the wool and unless they are removed they work injury to goods manufactured from such wool. We believe the time has come when Michigan wool growers should adopt a small twine of better quality.

A small linen twine used by nearly all wool growers in Australia is to be recommended in every way. While such twine costs about twenty-five cents per pound it runs nearly two thousand seven hundred feet to the pound. A pound of linen twine should therefore tie two hundred and seventy fleeces, allowing ten feet to each fleece, or one hundred thirty-five fleeces allowing twenty feet to each fleece. This linen twine is a soft twine and should the fibers become mixed with the wool fibers there would be no injury done. Number 18 hemp twine is also to be recommended. There are about sixteen hundred feet of this twine to the pound and it can be purchased for about ten cents per pound. The only objection raised to the use of a small fine twine for tying wool was that it was hard on the wool packers hands.

We can see how many growers would need to change their wool boxes to hold the ends of the twine. However, we do not hesitate to say that if Michigan farmers would generally adopt a small hemp or linen twine, this alone would go far towards placing Michigan wool on a par with Ohio and Pennsylvania wools.

A Merino fleece cannot be properly tied with one string each way. We can see no objection to using two or even three strings each way if it seems necessary to keep the fleece intact until it reaches the wool merchant or manufacturer. The great weight and character of the Merino fleece makes more twine necessary than with the more open woolled breeds of sheep. In our opinion two strings each way are sufficient. If the fleeces were not to be handled much, one each way would be ample.

The majority of the wool boxes, which tie the fleeces in a square bundle, are too small. The most of them were made for fleeces from Merino sheep

and new ones have not been made for handling more bulky, coarse wool. consequently; the fleeces are packed too snugly together. This gives them a heavy, soggy appearance when they should present a light, loose, and bulky appearance.

The method of tying wool in Canada is quite satisfactory. The fleece is spread out on a clean shearing floor with the outer ends of the wool up. The skirts of the fleece are folded in towards the center, only a trifle at each end, but considerable on the sides, so that the sides lap well, then the fleece is rolled from end to end, making a short cylindrical roll of wool. A small hemp twine is then run snugly around the roll a little distance from each end.

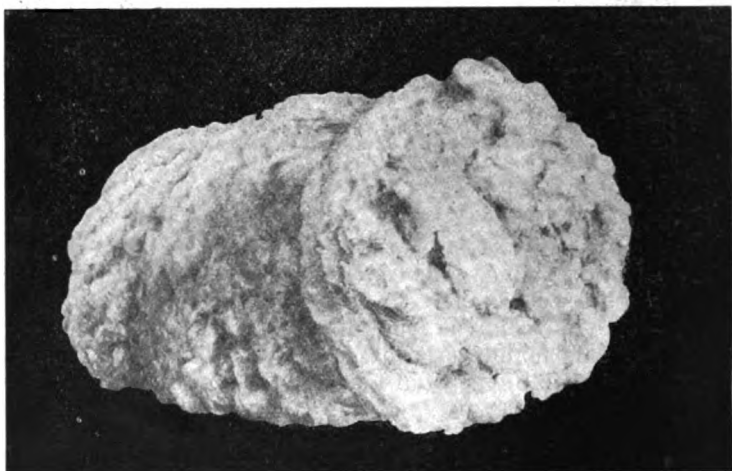


FIGURE NO. 7.

Fig. No. 7 shows a nine-pound Shropshire fleece tied in this manner. Seven feet of twine was used in tying the fleece. It is said that a good lively man, who is accustomed to tying wool in this manner, will tie after eight or ten shearers.

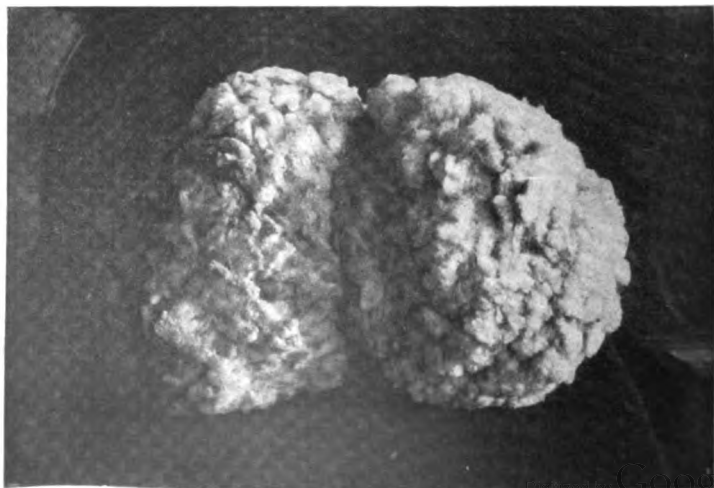


FIGURE NO. 8.

Fig. No. 8 shows a fleece tied up after the manner in which some Englishmen tie their fleeces. No twine is used, but simply a roll of wool. This method is in no way to be recommended. It is not economical of time and does not leave the fleece in good condition as it binds it too closely in some places, while it leaves the fleece in the best possible condition to get torn.

Before leaving this subject we wish to speak of a wool box which is quite generally used in some parts of Ohio. When the fleece is tied it does not have the heavy appearance that is so characteristic of the square box made fleece. It is sometimes spoken of as the round box or table, owing to the appearance of the fleece when ready for the market. The sides of the table or box fold up similar to the old style box, but in the center a broad leather strap is so arranged that when brought over the fleece it rolls it into a compact bundle.

We consider ourselves very fortunate in being able to give our readers the benefit of the following letter from J. B. Jones, Montpelier, Ohio.

"With a desire to correct errors in wool handling I hand you part of a Boston letter of the 14th inst."

The following is an extract of the letter referred to. It is from one of the leading wool commission houses in Boston:

"We finished grading your wool last week and find it to be a very good lot, running largely to 1-2 and 3-8 unwashed, good stapled and bright colored. We shall certainly do our best to realize for you extreme outside prices for this wool, but regret to say that we cannot sell it for Ohio, as most of it has been put up in boxes, and, as you well know, these box fleeces are one of the characteristics of Michigan wool. We think it would be well for you to notify farmers in your neighborhood not to use the box when tying up their fleeces, but wrap them up lightly and put two or three twines around them. This is sufficient to hold them and the fleeces handle much lighter and look very much more like Western Reserve, Ohio wools."

"Of five thousand six hundred pounds of washed wool shipped from Camden, Mich., this year, eight grades were made. The extremes in value 10 cents per pound. Of twenty-eight thousand pounds unwashed, ten grades, extremes in value nine cents per pound, these grades, exclusive of tags sold outside of fleeces. They put the X and above washed at five cents per pound below same grade of Ohio—though part of it was bought in Ohio and all of it equal in quality to average Ohio, in my judgment, based on forty years of wool shipping, mostly from Ohio. That Michigan wool sells below its real value because of improper and dishonest preparation is well known among dealers. It ought not to be so, now that grades are greatly improved and many producers are seeking for best methods of handling. But too many continue to tie in a square box with five to seven strings each way, or three to four ounces of twine to the fleece, so tight that it handles more like a cheese than a fleece of wool, and no man can know what is inside until the string is cut, revealing often unwashed tags in a washed fleece and one to two pounds of tags containing two ounces of wool, clipping of hoofs, lambs tails, etc., in unwashed fleeces; it will require time to remove the prejudice against Michigan wool. If growers will conform to the demands of the markets, adopt the round box with one ounce of twine to the fleece, throw their tags on

the compost heap, or sell for what they will bring, in a few years Michigan wool will be in demand at much better prices.

"I bought nine hundred pounds of well washed Delaine wool in Hillsdale county, round tied, no excess twine, paying twenty-eight cents per pound, which graded right up to Ohio at thirty-three cents in Boston, netting three cents per pound profit, while losing money on wool bought at twenty-three to twenty-four cents. Quality and condition generally observed is what Michigan needs."

In closing permit me to say that because Michigan wools are not the best we must not get the idea that they are the only wools which can be better grown or better prepared for the market. Other states are suffering from market prejudices which have been established by careless methods. Nor should we, knowing this, be any the less persistent in our efforts to place Michigan wool on a footing second to none in the open market.

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